

CONVERSATION

In the field: an interview with Robyn Hetem

Robyn Hetem is a Senior Lecturer at the University of the Witwatersrand, South Africa, where she is a conservation physiologist. After completing her undergraduate degree in Zoology and Physiology, she was appointed as a Researcher in 2008 while completing her PhD at the same university. Hetem has been recognised as a young researcher with the potential to become a future leader in her field by the National Research Foundation in South Africa. Telling us about her research experiences in southern Africa, Hetem reflects on working with species ranging from aardvark to zebra and the challenges they face as a consequence of climate change.

Where did you grow up, and how did you become interested in animals?

I grew up just outside Johannesburg in South Africa. I think my love for the African bush really came from my dad. I remember family holidays in Kruger National Park and other game reserves. We'd spend hours driving round looking for animals. My Dad was very organised. He used to print out lists of the birds and game that would occur in an area and then we used to tick off what we'd seen that day and count them afterwards. Dad was great at reading up about things and finding information to keep it interesting. He really managed to instil a love of the African bush and he encouraged my early career aspirations to become a game ranger. That started the idea that I could make a career out of something that I loved, so studying zoology became an obvious choice. I registered for a BSc at the University of the Witwatersrand, South Africa. The biological degree was quite general initially, but I remember being particularly interested in the physiology of animals, how they work, and then feeding that back into how their physiology fits into bigger ecology and conservation questions.

When was your first field trip?

I went on a couple of field trips when I was an undergraduate student. During my second year, we did a marine and coastal field course, where I learned about the diversity of life, and during a third year field course I had the opportunity to collect data. My first real field project was during my 4th year (honours) at the National Zoological Gardens Breeding Centre, in Lichtenburg, South Africa. The project was to attach tiny little black balls fitted with temperature sensors to collars on animals to measure heat loads experienced in different environments and to tell us whether an animal was in the sun or the shade. The plan was to put them on wildebeest, impala and zebra, but we couldn't catch zebra, so we ended up putting them on horses that were being used for another study. We fitted the collars and then I followed the animals to see if the sensors were cooler when the animals were in the shade than in the sun, and to see whether they were selecting warm microclimates at night. It involved a lot of behavioural observations in the field and the data collection probably lasted about 5 months. There's often a misconception that fieldwork is just a holiday, but it's really hard work! I love that when you are doing field work you really get to



learn so much more about the animals than you do when you just get a dataset to analyse. When you look at the data retrospectively, you remember events that happened on the day, what the animals were doing when the data were recorded. It really gives you greater insight when interpreting the data.

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Can you describe the process of darting an animal to attach a collar?

It varies a little bit depending on the animal, the site and what's feasible. Before going into the field we determine the best drug combinations to safely immobilize each species. Game capture manuals are our main point of reference and we also talk to experienced people in the field. Then the vet makes a drug cocktail, puts it in darts and fires the dart from a gun. Normally the animal goes to sleep within less than 5 minutes, so you've got to follow it and then get to it as quickly as possible, so that it doesn't hurt itself and other members of the troop or herd don't turn on it. Then, we try to get all other animals away from the anaesthetised animal to fit the collar quickly. The big advantage of the drugs that we use is that they are reversible, so at the end of the procedure you give a second drug, an

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Robyn Hetem and Maartin Strauss tracking Arabian oryx in the Saudi Arabian Desert. Photo credit: Linda Fick

antidote to the initial drug, so they can get up and hit the ground running. We can't have a groggy animal going in to the wild where it might face predators. Fitting a collar is quite quick and a standard procedure; you can probably do that in 10 to 15 minutes. Also, we often implant biologgers that record temperature, so we do surgery out in the field to get continuous remote measurements of their body temperatures while they're going about their daily business. Those procedures take longer than collar fitment and there's more preparation. We take a full surgery kit with us; a gaseous anaesthetic machine like you would find in an operating theatre to maintain sleep for as long as necessary and lots of monitoring equipment. Most of our work focuses on abdominal temperature – we are interested in body temperature in different environments, different species, how it changes over time – and those procedures take about half an hour. We also do more sophisticated surgeries occasionally. For example, we sometimes measure selective brain cooling, where we look at brain temperatures and carotid artery temperatures; that surgery can take 2 to 3 hours.

How do you track animals?

In the early days we relied on VHF transmitters in the collars. We would drive around until we picked up the VHF beep on a receiver and then use a directional antennae to track down the animal. Recently, we've started working in Botswana and Namibia, where there are no fences, so the areas that we cover are large, and we started to rely on satellite GPS to locate animals. Then we often bring in a helicopter with a vet to find the herd and dart the animal with the collar. An experienced vet and chopper pilot team is absolutely incredible to watch. The pilot knows exactly how to position the chopper so that the vet can get the dart in successfully and there's incredible trust between them. Normally we have about five to 10 people in our team, including the vet and pilot, with a crew on the ground in a vehicle carrying the surgical kits and extra support people.

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Which species has been the most difficult to study in the field?

The one that sticks out for me was the armadillo. They're rare and few people have actually seen one. We had a Master's student who was fascinated by them. He said that he had seen them all the time on the

game farm where he was working and he wanted to study them, so we tried. At the first site we spent at least 20 nights just driving around looking, but we didn't have any luck. We found a couple of armadillos but couldn't get our hands on them. We tried setting traps outside of the burrow; except the armadillo were clever enough to tunnel around the trap and find a different way out. One night we tried to dart, but the dart missed, so we gave up and our student worked on a different species. Later, we got the opportunity to go to work in Tswalu in the Kalahari. Through trial and error, we found that if a vet can slowly sneak up on an armadillo and dart it, the animal trots off a short distance, falls asleep and we can do surgery to implant temperature and activity biologgers. In terms of the hours of effort just to find a technique to catch these critters, armadillo would probably be the most challenging. Eventually we caught 7 armadillo, which were doing really well, but then we had a drought and 6 of them died. In trying to understand what was going on, we looked at the body temperatures and we realised that they were getting really cold during the drought; they were struggling to maintain their energy balance. That started a longer term study trying to understand why our armadillos were struggling and it looks as though the ants and termites that they rely on for food move deeper underground when a drought hits, so that the armadillo can't access them. Our armadillo were starving.

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How long does it take to prepare for a field trip?

From trying to find a field site, developing relationships and negotiating with land owners and managers, applying for the necessary ethical clearance and permits, I'd say probably 6 months to a year of planning. We have an animal ethics committee at the University of the Witwatersrand and all of our studies have to go through them to get ethical approval. Because we've been doing these types of study for so long and with so much success, our ethical committee knows that we maintain the highest level of integrity; animal welfare is our top priority. Within each application, we need to justify the technique used, which drugs we're using, why we're using them, how we will minimise any discomfort to the animal – in terms of the painkillers and antibiotics – and we have to show that we will not use more animals than are required. It's quite a lengthy application to put together, but we know what's important, so we have never had a problem getting ethical approval.

How much do you rely on local expertise when you work in other countries?

Local expertise is crucial. For example, when we work in Namibia we have very close relationships with the Ministry of Environment and Tourism (MET). They provide incredible support in terms of facilitating the permits that we require: we use their vets and their chopper pilots. We also rely on local expertise from park officials, guides, scientists and the community to tell us when it's a good time of year to do a study. Sometimes they warn us that it will be too wet to access the roads, or they tell us where they last saw herds of the species of interest, so we can adjust when and where we search for animals. We then feedback our research findings to people involved in conservation to influence management decisions. Our relationship with Piet Beytell from the MET in Namibia has been really fantastic in those terms.

What contingencies do you plan for before going out into the field?

We have spares for everything: extra drugs in case a bottle breaks on a bouncy road; two anaesthetic machines in case one starts to give problems; extra oxygen, extra everything. It does mean we take quite a lot of stuff with us. There's a 7 page list of all of the things that we might need, with a well packed toolbox being essential, including duct tape, cable ties and silly little things that can become crucial, like an O-ring for an oxygen regulator; if that breaks, we can't do without it.

What are the main risks when working in the field?

The main risk is making sure that animals don't wake during procedures. Due to their sheer size, if an animal did wake up, it could injure people. Maintaining anaesthesia and having a good team that knows how to handle animals are key to mitigating those risks. Once, we had just darted a gemsbok in Botswana when the chopper pilot said, 'I'll be back' and disappeared in the helicopter. After he returned, we asked where he had gone and he explained that when we were darting the gemsbok there was a lion that was stalking the herd. He had gone to chase it away with the chopper. Another time we were doing surgery on a roan antelope in Namibia. It had fallen asleep close to a waterhole and we were unintentionally blocking an elephant's path to the water. We had people monitoring all the time and the elephant did mock charge, but we had enough people to make noise to distract it and ensure that all ended well.

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Can you tell us about your experiences of doing field work in Saudi Arabia?

I went to work on Arabian oryx and Arabian sand gazelle as part of my PhD. I was a young single female at the time, which meant that I had to make cultural adjustments to work in Saudi Arabia. For example, I wore a long abaya and head scarf at all times. The first time I went for a scouting trip with a male vet, to see what was feasible and what we should plan for. When we arrived at Taif International Airport passport control, they stamped the vet's passport but then they looked at me and asked if we were related as it is not the custom for a woman to travel with a man that is not her husband, father, uncle or brother. They sent the vet to fetch his luggage, but I got sent to one corner and I was worried that I was going to be deported. Although I had a government letter saying that I was working with government organisations with all of the permissions and permits in place, at that time women in Saudi Arabia weren't allowed to drive. The airport authorities kept asking if I had a driver. Eventually I was escorted through customs to find my driver. When my collaborator, Maartin Strauss from the Saudi Wildlife Authority, stepped forward to assist, they took all of his documents for verification and I had to spend another half hour explaining that he wasn't my husband either. When I was finally allowed through there were additional checks at road blocks along the way, so it was about 3 in the morning by the time we got to the field site and I was exhausted.

While we were there we worked closely with Maartin. Arabian oryx went extinct in the wild in the 1970s and Maartin was monitoring the reintroduction process. He stayed with us the whole time that we were in the field. Then we returned for a second field trip to implant the animals with temperature and activity biologists. I spent about 6 weeks monitoring the animals after the surgery, but after I came home a number of the rules changed and I was not allowed back into the country. It took a year of negotiating to get me another visa. Fortunately, Maartin was there, so he kept an eye on the animals. Once we got my visa we went back to retrieve the loggers from the animals to get as much data as we could from the project.

How has COVID-19 affected your fieldwork?

We had quite a hard lockdown in South Africa. For a number of months, we weren't allowed to travel and the provincial and national borders were closed. A lot of our research at the moment is in Botswana and Namibia, particularly our projects looking at how physiology informs animal movements. All of the new projects that were planned this year had to be postponed. Where possible, we tried to arrange for people on site to retrieve data loggers before the collar batteries went flat and the transmitters failed. Some of our new projects not only depend on regional travel but also on collaborators flying in from the UK or USA; we don't know if, or when, they will be allowed into the country, or when travel restrictions and periods of quarantine will be lifted. In addition, our research budgets are being reallocated to support people who are struggling financially with the economic downturns. It's a very challenging time for field research.

What are the applications of your research?

Understanding climate change. Everyone is aware of climate change and we're getting real evidence that the Earth is getting hotter. In Africa we're also getting drier in many regions. What we're starting to understand from looking at the physiology of different animals is that it's okay if it's hot, as long as they have access to water. We are also trying to understand how much flexibility animals have to cope with a new environment that they've never experienced before. Sadly, many of the current models say that we're going to lose two-thirds of our African mammals if we keep them fenced in – there are a lot of fenced reserves in South Africa – and they are unable to adapt. What we want to know is how much capacity they have to adapt. If they spend a little bit longer in the shade today, will they be okay? Can they shift the time when they would normally eat to a cooler time of day, or might they then risk being exposed to predators? Depending on the species and what we're looking at, we want to know how different stressors interact and how much flexibility they have to survive a hotter and drier future.

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Robyn Hetem was interviewed by Kathryn Knight. The interview has been edited and condensed with the interviewee's approval.