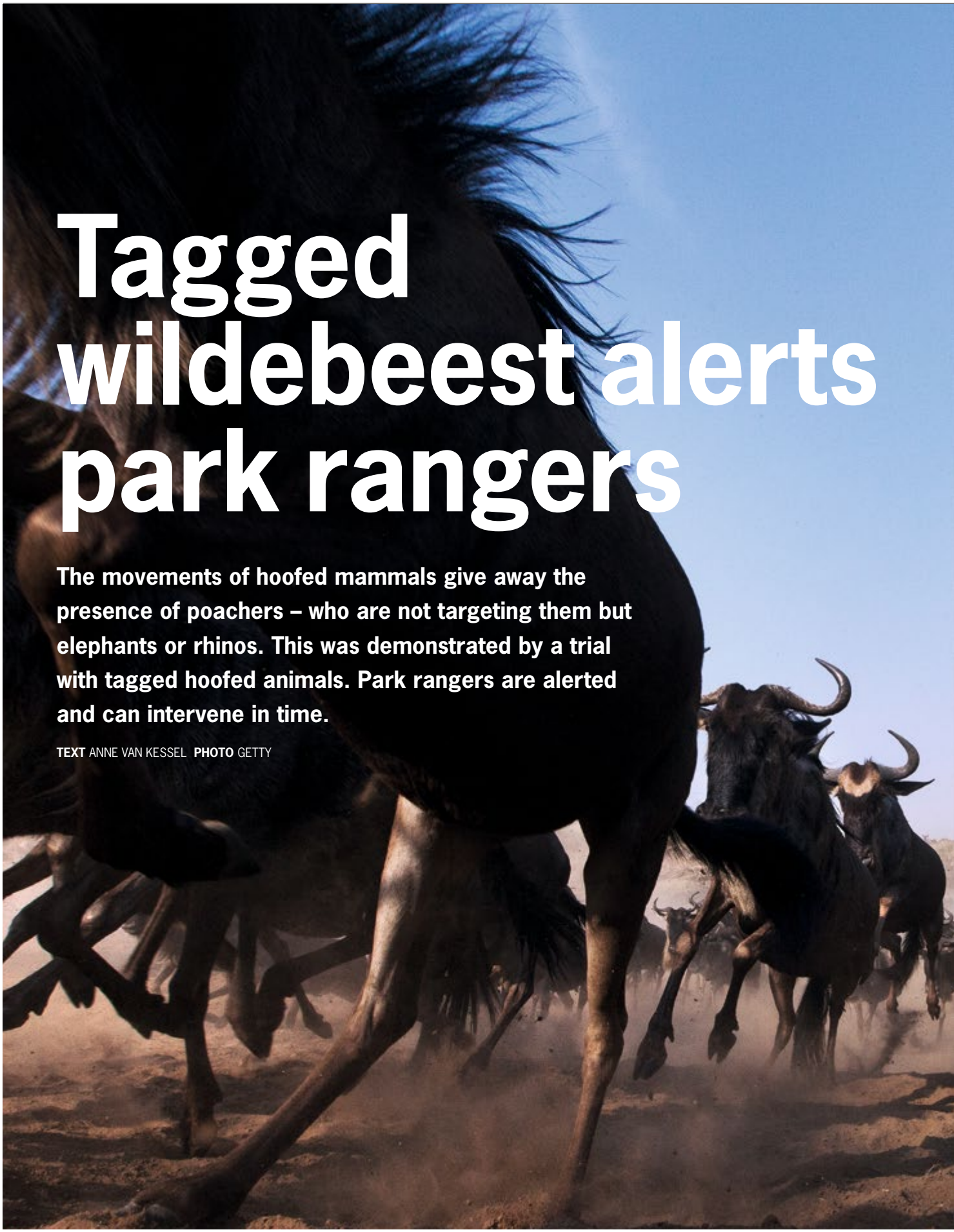


Tagged wildebeest alerts park rangers

The movements of hoofed mammals give away the presence of poachers – who are not targeting them but elephants or rhinos. This was demonstrated by a trial with tagged hoofed animals. Park rangers are alerted and can intervene in time.

TEXT ANNE VAN KESSEL **PHOTO** GETTY

The ivory trade ensured the extermination of 90 per cent of the African elephant population over the past century. And even now, about 55 African elephants are killed every day, although rhinos and elephants appear to have benefitted from the lockdowns. In 2019, 594 rhinos were killed in South Africa; in 2020, 394 were killed. But game park managers fear for an increase after the pandemic. In December, when the lockdown was briefly lifted, experts from the South African parks saw an immediate increase in poaching.

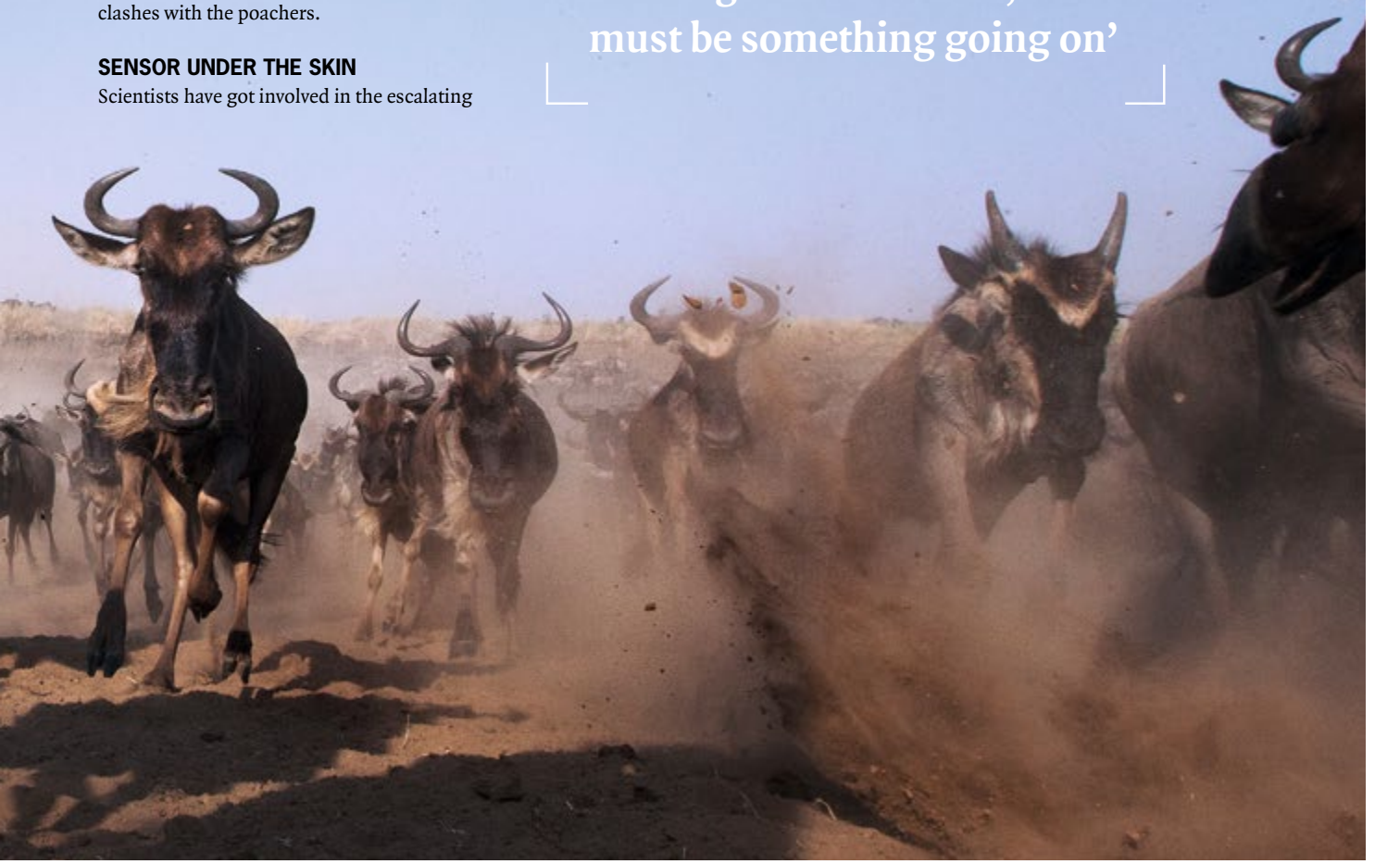
The main poaching zone in South Africa is the Kruger Park: a game park on the border with Mozambique that covers an area the size of half the Netherlands. For a few years, heavily armed park rangers have been patrolling the park together with the army. This leads to regular and sometimes deadly clashes with the poachers.

SENSOR UNDER THE SKIN

Scientists have got involved in the escalating battle too. A few years ago, British researchers came up with the idea of implanting sensors under the skins of rhinos and hiding tiny cameras in their horns. The idea was that if anyone came too close to one of the animals, its heartbeat would speed up and the park rangers would receive a signal to go and find it. If they got there too late, the camera would have snapped the poacher. A nice plan, but dangerous too, because what if the poachers hack and read the sensors? Then science will help them instead of the rhino. And there's the question of how quickly rhinos react to their attackers. Rhinos and elephants are rarely predated by other animals and are therefore not particularly alert to danger.

This idea led Wageningen researchers in the Wildlife Ecology and Conservation chair group to think up a different plan. Prey animals such as zebras and wildebeest do react quickly to disturbances and threats such as lions. They probably react to poachers as well, even though they are not targeted by them. So could zebras and wildebeest serve as informers? >

> 'If an animal suddenly starts running in hot weather, there must be something going on'



To figure that out, ecologist Henjo de Knegt and his colleagues set off for South Africa in 2019 with a Dutch Research Council (NWO) grant. In the Welgevonden game reserve in the north-east of the country, they fitted 138 zebras, impalas, wildebeest and elands with a collar carrying a GPS, an accelerometer and a thermometer. 'If an animal suddenly starts running in hot weather, there must be something going on,' says De Knegt.

The data from the transmitters goes first to a mast with a receiver, and from there to a data centre in Europe via a 3G or 4G internet link. The researchers in Wageningen receive, decode, and analyse the data using an algorithm developed in Wageningen.

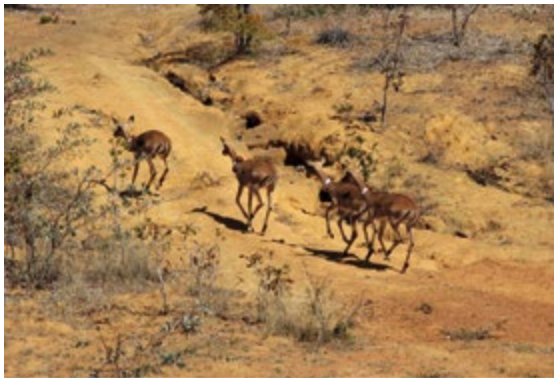
Fitting the animals with the transmitters was a big job. 'Team members flew over the park in a helicopter with a vet to do it,' says De Knegt. 'When they saw an animal, they anaesthetized it with a dart and sent the coordinates to their colleagues on the ground, who drove there as fast as they could and put the collar on.'

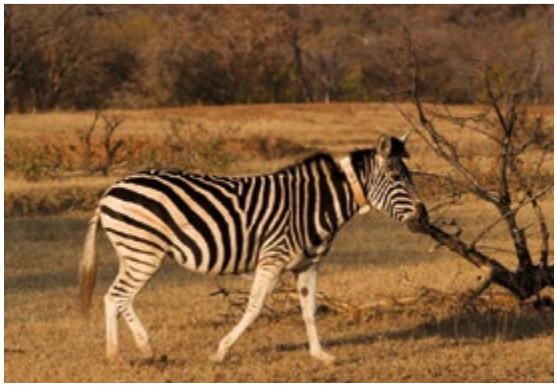
A lot of the animals in the study had come from other parks. 'In Africa, parks exchange animals in order to maintain genetic diversity and to increase or limit populations,' says De Knegt. Some animals were transferred to Welgevonden from other parks, and the researchers made grateful use of them. 'It was relatively easy to fit these animals with a transmitter when they arrived at the park.'

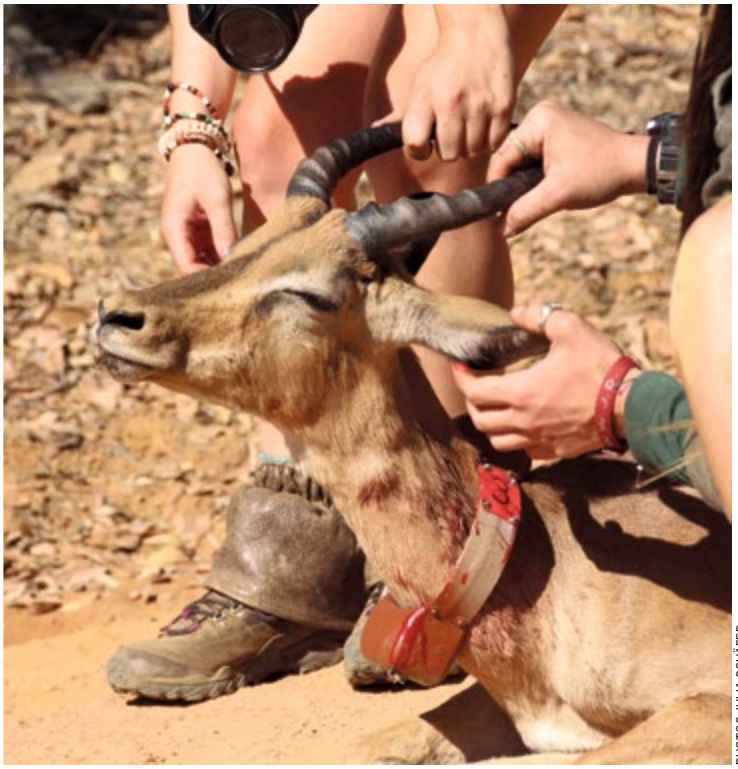
All the animals were brought to a fenced-off section of the park, to restrict the research area. There the researchers and the park staff simulated disturbances, imitating tourists, for instance, who were exploring the park by car or on foot. 'In other experiments, we asked the park rangers from the anti-poaching unit to act like poachers. They know how to move through the bush without being noticed.'

To motivate the park rangers to do their very best not to be spotted, they were told to look for a wildebeest with a red spot on its back.

'We ask the park rangers to act like poachers'







PHOTOS JULIA SCHÄFER

Impalas, zebras and eland antelopes get transmitters in Welgevonden game park in South Africa.

Whoever found it could shoot it and eat the meat. 'At least, that was what the park managers told the park rangers. In fact, there was no such marked animal.'
During one of the first experiments, De Knegt's colleague Jasper Eikelboom pretended to be a tourist. Back in Wageningen, De Knegt looked at the data coming in from the animals' collars. 'After the trip, Jasper was a bit disappointed that he hadn't seen any game. From the data I could see that there was game near him, but that the animals fled before he had seen them.'
With the algorithm, the computer could detect 86 of the 100 simulated disturbances, as we can read in the article published in *Nature Scientific Reports*. The algorithm assessed whether the tagged animals behave abnormally. To establish what their normal behaviour was, the animals were allowed to roam around with the collars on for 11 months, which generated a huge mountain of data.
It was apparent from the experiments that animals sound the alarm when tourists or poachers come within about 500 metres of them. De Knegt: 'The animals are already reacting before the people can see them.'
The concept has already been proven to work, according to De Knegt. But the system is not yet ready for use. In nine per cent of cases, the computer sounded the alarm unnecessarily. And in Welgevonden, there are no large predators such as lions, although other big cats are found there now and then. De Knegt: 'Leopards occasionally come into the park, hunting antelopes and impalas. You can't keep them out with fences.'

IMPALA UP A TREE

The experiments back this up. 'At one point I saw that the signal of one of the impalas stayed at one spot.' That could mean one of two things: either the impala was dead, or its collar had come off. 'I sent Jasper to look. He found the impala hanging in a tree. A leopard must have done that.'
The question is whether the system can distinguish between the way a zebra reacts to a lion and to a poacher. De Knegt thinks it can. 'The more unpredictable something is for an animal, the stronger its reaction. A lion is not entirely unpredictable: zebras and lions have evolved together and have lived side by side for a long time. But they don't meet so many humans so an encounter with humans will prompt a stronger response.'
A new experiment – which has been delayed by the pandemic – should show whether De Knegt is right about this. 'In a Kenyan park we are going to tag not just prey animals but also lions and hyenas.'

> **'There will be a stronger response to a human than to a lion'**

HACKED

The technique offers several advantages over the sensors used on rhinos and elephants. 'If this system gets hacked, the poachers don't gain anything from the data. They know where the prey animals are and where they are themselves,' laughs De Knegt. 'Also, it is easier to tag the prey animals and they are often present in larger numbers than elephants and rhinos. This makes it possible for us to observe changes in behaviour earlier.'
Both techniques have the advantage that park rangers can head straight for the criminals. 'This will mean fewer chance encounters that can lead to an exchange of fire.'
But there are disadvantages too, such as the costs. De Knegt: 'Not only do you need transmitters that have to be put around the animals' necks manually, but you also need receiver stations. These kinds of game reserves don't have electricity, so you need solar panels and batteries.'
What is more, the masts with the receiver stations must be strong enough to withstand a knock from an elephant. 'Our technical partners MTM and IBM installed the masts and antennae for us. In future, the parks will have to organize that themselves.'
The transmitters used in this study lasted a year, but new sensors with solar cells could be operational for several years or even the animal's whole life.

CREATING SAFE HAVENS

Not every park can afford such a system. 'There are parks in Africa where the managers don't even have enough money to buy shoes for all the park rangers,' explains De Knegt. So there's a big chance of poachers shifting their operations to parks without transmitters. The ecologist comments on this: 'Even if that is the case, you are still creating safe havens where the animals can live undisturbed and where you can maintain the genetic diversity.'
But he makes no claim that the sensors provide a one-stop solution to the problem of poaching. 'Poaching is a multifaceted problem, which you've got to tackle on several fronts at once. I hope we have a contribution to make because we don't target the poacher directly.' He is referring to techniques such as drones and fences with sensors, which do target the poachers themselves. 'Such techniques often offer advantages for a few weeks, but you always get into an arms race with the poachers. They think of an answer like a heat-resistant suit or camouflage clothing or just switching off the sensors on the fence. And then you need to come up with something new.' De Knegt hopes the Wageningen solution will last for a long time. 'How can a poacher arm himself against herds of smart animals?' ■

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