

Tracking the rhino killers

A database of rhinoceros DNA could help in the fight against organised crime

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ANTIQUe dealer Donald Allison was waiting to board a flight bound for China at Manchester airport in the UK on 30 June 2009 when he was stopped by border officials. He had with him an unusual sculpture of a bird on a log, purported to be an antique. Hidden inside the log were two rhino horns. On 5 October this year Allison was convicted of attempting to smuggle horns from an endangered species, and jailed.

Allison's conviction may never have happened without the assistance of a DNA database called RhoDIS. Short for "Rhino DNA Index System", RhoDIS promises to do for wildlife crime what the human DNA database has done for murder investigations.

The fight against wildlife crime – the illegal trade of endangered species such as rhinoceros and tigers – hit a high this month. At its general assembly in Doha, Qatar, last week, Interpol unanimously passed a resolution calling on its member nations to support the fight against such crime. "Hopefully it will send ripples across the policing world," says John Sellar, chief enforcement officer for the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

And at the International Tiger Forum in St Petersburg, Russia, this week, five major agencies, CITES, Interpol, the United Nations Office on Drugs and Crime, the World Bank and the World Customs Organization, will form the International

Consortium on Combating Wildlife Crime (ICCWC).

Interpol's interest reflects a growing awareness that wildlife crime is big business. Rhino poaching, for instance, has become increasingly sophisticated. Typically, gangs fly in on light aircraft, use veterinary darts to sedate animals and cut off their horns without alerting rangers, then leave the animals to bleed to death.

The picture that is emerging is that poaching is not driven by poverty-stricken people desperate to make a living but by organised criminal networks seeking big profits (*New Scientist*, 11 September, p 28). These are the same international networks that are involved in money laundering

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and human and drug trafficking. Enforcing wildlife law could therefore have knock-on effects. "Al Capone did not go to jail for being convicted of being a gangster," says Sellar. "He went to jail for not paying his taxes."

So far, however, there have been few convictions for wildlife crime. As with the drugs trade, "the people caught red-handed when you make a seizure are the small guys – the people behind it can just wash their hands of it," says Rob Ogden, a conservation geneticist at the Royal Zoological Society of Scotland in Edinburgh, UK, and part of the team behind RhoDIS.

Better collaboration between



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international agencies and new forensic techniques could change that. Ogden believes RhoDIS could help reveal rhino horn trade routes and give police intelligence to aid the prosecution of those higher up the chain.

RhoDIS is the first DNA database for a major black market flagship species that lets you identify the individual animal that seized goods came from. DNA can be extracted from a horn destined for alternative medicine markets in Vietnam, for example, and matched back to a carcass found in an African national park or a zoo.

The database works in much the same way as human DNA

databases do. It runs on the same rigorous forensic guidelines set by the FBI for its human database, CODIS.

Typically, the RhoDIS team will extract DNA from a seized rhino horn using a new, sensitive technique, the details of which have yet to be published. A DNA profile is then produced by sequencing 14 genetic markers. As with other kinds of DNA testing, markers are variable, repetitive non-coding segments of the genome, called short tandem repeats, which are heritable. This profile can then be compared to those in the RhoDIS database, which contains profiles collected from live and

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Rhino horns are big business

dead rhinos in Africa and Europe, or to samples taken from recently discovered carcasses.

In itself, a match is not enough to say that a seized horn comes from a specific rhino: as with humans, two rhinos can have

airport, the DNA from the smuggled horn was matched with a 1 in 18,000 certainty to a rhino called Simba from the UK's Colchester Zoo (see "Smugglers jailed thanks to DNA").

The more individuals contained on a database, the more robust the statistics. RhoDIS currently has profiles from 200 wild rhinos in Africa and 35 kept in European zoos, making it robust enough to stand up as court evidence. Still, there are so few rhinos left in Africa that the RhoDIS team aims to cover 75 per cent of all African rhinos "because we can", says Ross McEwing, director of the wildlife forensics organisation TRACE Network based in Edinburgh.

the same DNA profile. The crucial question is the likelihood of the match. This is where the reference database comes in, as it makes it possible to calculate a "match probability". For example, in the seizure at Manchester

SMUGGLERS JAILED THANKS TO DNA

After 30 years as a well-loved animal at the UK's Colchester Zoo, visitors and staff were saddened when 41-year-old Simba, a white rhino, fell ill in April last year and had to be put down. But their grief soon turned to horror when Simba's horns turned up inside a fake antique sculpture seized at Manchester airport in June, destined for the Chinese medicine market.

A DNA profile from the horns had been obtained by scientists working on a new rhino DNA database called RhoDIS. Meanwhile, the UK customs authority contacted the British and Irish Association of Zoos and Aquariums to check for recent rhino deaths and learned of Simba's demise. His keepers had stored blood samples from medical checks, which provided the RhoDIS team with his

DNA profile, and the database confirmed that the horns were his.

Although Simba was sent to a slaughterhouse to be incinerated, it appears someone stole both his horns and put them on the black market, where they sell for up to £30,000 a kilo. The smuggler, 52-year-old Donald Allison of Inglewhite in Lancashire, was jailed for 12 months on 5 October. A police investigation is on-going.

In another case, Vietnamese security guard Xuan Hoang was sentenced to 10 years in jail by South African authorities this June for trying to smuggle seven rhino horns to Vietnam. The horns were seized at OR Tambo International airport in Johannesburg. The RhoDIS team used DNA to match them to rhinos that had recently been killed by poachers.

The team are also in talks with officials in south-east Asia about extending RhoDIS there.

"We have reached a stage where this is a useful tool," says McEwing. "We need to be at a stage where it's a significant deterrent – and that requires resources."

Subject to funding, the RhoDIS team now want to create a tiger DNA database. Tigers are critically endangered and products made from their body parts are in high demand. "I don't think the general public understands just how close we are to losing them altogether," says Sellar. "We really are facing a very, very serious situation there."

The rhino database has been greeted with enthusiasm. "It is definitely an excellent resource for combating the problem of rhino poaching," says Mary Burnham-Curtis, head of genetics at the US Fish and Wildlife Service's forensic lab in Ashland, Oregon. "The ability to identify individual rhinos provides a concrete link between a crime scene and custody evidence."

"I am delighted that they are doing it," says Sam Wasser, director of the Centre for

Conservation Biology at the University of Washington in Seattle. His team developed a DNA database for elephants which has been used by Interpol to link ivory seizures to geographic locations, but not specific individuals.

In addition to tracing the fate of dead rhinos, RhoDIS could be useful for efforts to conserve this dwindling species, says Paul O'Donoghue, a conservation biologist at the University of Chester in the UK, who is also involved in the project. Profiling a large number of African rhinos could reveal the patterns of gene flow and general genetic health of populations, information that could aid decisions to move animals to new areas to re-invigorate populations.

The black rhino population has been culled – illegally – by 97 per cent in the last 40 years, plummeting from 100,000 individuals to less than 3000 today. According to Sellar, one rhino is killed every 30 hours in South Africa. "They have just been hammered by poaching," says O'Donoghue. "This is the rhino's last stand." ■