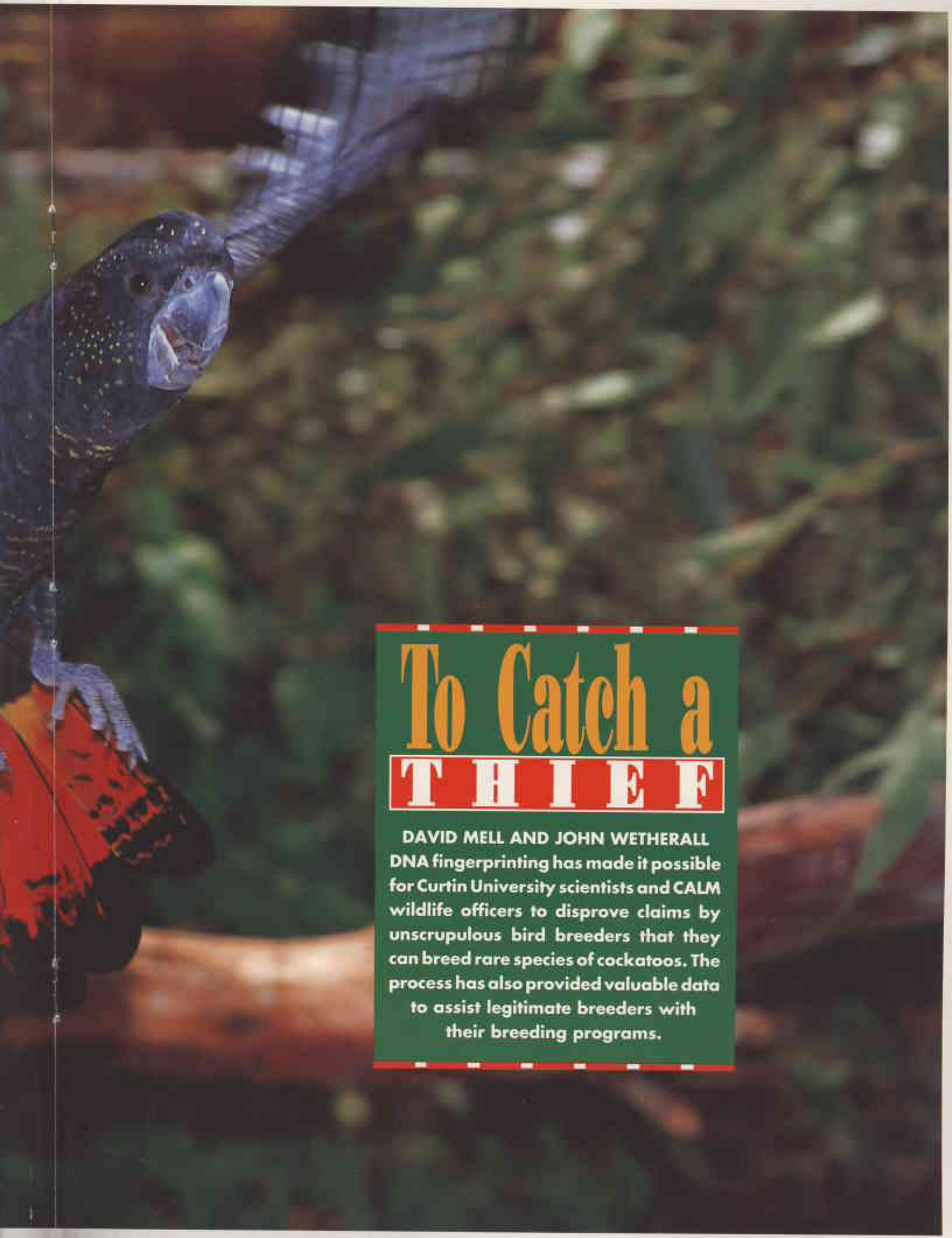


To Catch a THIEF

DAVID MELL AND JOHN WETHERALL

DNA fingerprinting has made it possible for Curtin University scientists and CALM wildlife officers to disprove claims by unscrupulous bird breeders that they can breed rare species of cockatoos. The process has also provided valuable data to assist legitimate breeders with their breeding programs.

White-tailed and red-tailed black cockatoos are widely recognised as being difficult to acquire and breed. Before 1987 very few Western Australian aviculturists had successfully bred these highly valued birds. However, during 1987 and 1988 claims of breeding success increased dramatically.

Scarce and in demand, red-tailed black cockatoos (*Calyptorhynchus magnificus*) retail within Australia for $5 000 a pair, and Baudin's white-tailed black cockatoos (*Calyptorhynchus baudinii*) at $3 000 a pair. Smuggled overseas, these birds fetch far greater prices.

At about the same time as the increase in claims of breeding successes, wildlife officers from the Department of Conservation and Land Management (CALM) noted a disturbing rise in nest-robbing activities in various parts of the natural range of both species. They suspected that many young birds were being removed from nesting sites and were entering the WA aviculture trade as 'bred' birds. It became apparent that a laundering racket existed within the avicultural industry; for example, any licensed aviculturist with a pair of rare cockatoos could claim to have bred offspring from them in captivity. The wildlife officers were faced with the problem of determining the truth of breeding claims.

In Europe, a new scientific technique, referred to as 'genetic fingerprinting', had been applied to verify claims of captive breeding of hyacinth macaws (*Anodarhynchus hyacinthinus*), in a well publicised prosecution of two Dutch bird dealers. With this in mind, CALM wildlife officers David Mell and Kingsley Miller approached Associate Professor John Wetherall of Curtin University's School of Biomedical Science to see if the technique could be applied to cockatoos in Australia.

Professor Wetherall and David Groth are leading authorities on DNA fingerprinting in Australia. They had successfully applied the technique to many animal species and have used it in high value stock-breeding programs.

Genetic fingerprinting is the scientific analysis of DNA (deoxyribonucleic acid), the main constituent of the chromosomes of all organisms. The examination of DNA for a particular group of genes can determine the family relationship of individuals of that species. Genetic fingerprinting has been used successfully to convict serious criminals, such as rapists and murderers, and clear those falsely charged with such crimes.

Wetherall and Groth told CALM they could assist with the DNA fingerprinting of cockatoos, but it would depend on establishing a database of DNA profiles of a small number of individuals and family groups of birds.

CALM successfully sought funding for the establishment of a DNA database from the Australian National Parks and Wildlife Service's (ANPWS) States Cooperative Assistance Program. John Ingram from CSIRO and Gary Martin from the Agricultural Protection Board provided valuable assistance with blood collection from wild, as well as captive, red-tailed and white-tailed black cockatoos.

A small sample of blood (1 millilitre or less) was required from each bird, and was extracted from the bird's wing veins. Every effort was made to minimise stress on the birds. During the entire operation more than 100 birds were tested and none developed any problems from the process.

Previous page:
Red-tailed black cockatoos are scarce in the wild, and prices for captive birds are high.
Photo - Robert Garvey

The white-tailed black cockatoo is confined to the south-west of Western Australia, and a valuable catch for unscrupulous bird breeders.
Photo - M&I Morcombe

Above left from top to bottom:
Wandoo woodland is ideal nesting country for white-tailed black cockatoos.

Wildlife officers cover holes cut by nest-robbers with sheets of tin so the nesting hollow can continue to be used by cockatoos.

Red-tailed black cockatoos usually lay only one egg in their salmon gum nest hollows.
Photos - Jon P. Green

Top right:
Blood samples from yellow-tailed black cockatoos in South Australia have been sent to WA for DNA fingerprinting to give the species greater protection.
Photo - Jiri Lochman

Right:
Chicks aged 8 - 11 weeks are most often stolen from the nests, although eggs and younger chicks are also taken.
Photo - Jiri Lochman

Far right:
Red-tailed black cockatoos are found in the south-west where they are scarce, and in the Kimberley.
Photo - Robert Garvey

As a result of their research, Curtin University scientists advised CALM they had extracted DNA and recorded DNA bands which identified parent-progeny relationships in cockatoos.

Wildlife officers subsequently called on aviculturists who had claimed to have bred young red-tailed and white-tailed cockatoos. Thirty-six birds - 30 white-tailed black cockatoos and six red-tailed black cockatoos - were taken from nine aviculturists. Of the nine aviculturists who had their birds DNA-tested, the technology proved that one breeder had been successful as claimed. In this case the aviculturist had cooperated with wildlife officers, volunteering his birds for testing. The other eight all claimed breeding success, but subsequently many admitted that most of the young cockatoos had been taken from the wild.

A number of other birds were also seized from aviculturists who readily admitted that their claims of breeding successes were untrue. Most of these birds had been acquired from the wild unlawfully.

Word quickly spread among aviculturists that DNA technology was being used and there was a sudden decline in red and white-tailed black cockatoo breeding claims. In addition to the use of DNA technology, the knowledge that the DNA technique was available had an immediate effect as a deterrent.

To date, four cases have been dealt with in court. In all cases the birds were forfeited to the Crown and the aviculturists heavily fined.

The use of DNA technology has resulted in a more accurate reflection of

breeding success claimed by aviculturists. The few who continue to claim breeding success have cooperated with wildlife officers and willingly offered birds for DNA testing.

DNA technology has also been applied to the management of naretha blue bonnets (*Northiella haematogaster narethae*). This sub-species is very rare in captivity and is consequently a target for poaching.

CALM approved the capture by a private aviculturist of 40 narethas in January 1991. This founder colony will be used to establish a captive breeding colony to make the birds available to the avicultural industry.

The birds were DNA fingerprinted and a database of the profiles was established. Comparison of the DNA profiles of new birds in the future with the database can determine if they were derived from the original stock.

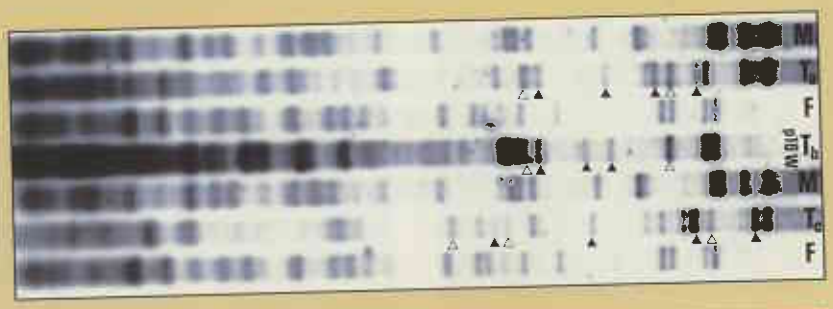
Parent-progeny relationships can also be substantiated. Entry of illegally captured narethas into the avicultural trade can be prevented, thereby protecting stocks in the wild from poaching.

It is hoped that CALM can continue to work closely with aviculturists to ensure that wild stocks are properly protected and do not enter the industry illegally. A benefit for aviculturists is that DNA technology allows them to verify a bird's legitimacy and can provide genetic information for breeding purposes, improved security for high-value birds and the potential to identify the sex of immature birds.

Other State wildlife authorities have noted the successful use of DNA fingerprinting in Western Australia. South Australian authorities have already sent blood samples to Curtin University from Major Mitchell and yellow-tailed black cockatoos, two species that are targeted by nest-robbers and found to be entering the avicultural industry in that State as 'bred' birds.

The establishment of databases for these and other species can ultimately assist all States in managing aviculture to ensure the protection of parrot and cockatoo populations in the wild.

The technique can also help to prevent the illegal introduction of exotic birds by proving whether birds have been bred in Australia or have been illegally imported.



DNA FINGERPRINTING AND BIRDS

DNA (deoxyribonucleic acid) is said to be the"stuff of life", as every living organism has DNA packaged into chromosomes. The chromosomes are in turn made up of genes which control the working of each cell in the body. It has been scientifically established that every human has unique DNA and half of a person's DNA comes from the father and half from the mother.

These principles are used in the process of DNA fingerprinting, which was first discovered by scientists in the United Kingdom in 1985.

THE METHOD

The technique of DNA fingerprinting, as used in forensic science, has been applied to bird blood samples, both overseas and now in Western Australia.

Firstly, a small blood sample (less than one millilitre) is taken from the wing vein. Then the membranes of the blood cells are ruptured (lysed) to release the DNA, which is separated from the impurities until a purified sample is collected.

The DNA is then cut by biological scissors, called restriction enzymes, into smaller fragments. The soup of fragments is loaded onto an agarose gel in an electrolyte solution. An electric current is then applied and the fragments move through the gel.

The smaller fragments move further than the large pieces, thus producing a gradient of fragments. The separated fragments are transferred onto a nylon membrane by a process called "Southern blotting".

The gel is then discarded. The membrane containing the DNA is dried and treated to irreversibly fix the DNA onto the membrane.

A solution of DNA probe containing radioactive phosphorus is prepared and added to a bottle containing the membrane. The probe binds to each fragment of DNA on the membrane which it recognises.

Excess probe is washed from the membrane, which is exposed to an X-ray film. The radiation emits small packages of light onto the X-ray film in the same position as the "hot" DNA on the membrane. The result is a series of dark bands on the developed film, much like a bar code.

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The authors acknowledge the valuable assistance of Kingsley Miller, Special Investigations Officer with CALM, David Groth, Scientific Officer, and Graham Hall, Research Scientist with the School of Biomedical Science, Curtin University, in the preparation of this article and the work involved in this project.

You don't have to go far from Perth to enjoy the peace and quiet of the bush. The forest is right on our doorstep. See page 10.

LANDSCOPE

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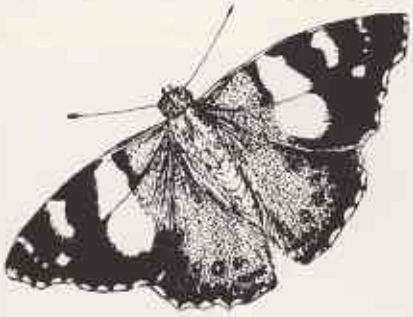

Painted ladies, northern admirals, southern admirals and Western Australian skippers - not the stuff of a sailor's dream, but all members of the butterfly family. See page 23.

Our native animals are prey to introduced species. While baiting gives them a fighting chance, scientists are looking for more long-term, humane solutions. See page 16.

The increase of births in captivity for cockatoos seemed promising, but was it related to the upsurge in 'birdnapping' in the wild? To Catch a Thief *explains how forensic experts unravelled the mystery. See page 28.*

The bilby has many names, including ninu and dalgyte. Ninu Magic *tells the story of this shy animal and its remarkable survival skills. See page 43.*

FEATURES

REGULARS

COVER

The red-tailed black cockatoo (Calyptorhynchus magnificus) *is one of several cockatoos native to Western Australia. These spectacular birds nest in tree hollows and can be found in the woodlands and grasslands of the south-west of Western Australia.*

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