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Breeding for genetic diversity

Strands of hair from the extinct Tasmanian tiger may help to further maximise genetic diversity in Tasmanian devil breeding populations.

An international team of scientists sequenced a large proportion of the genes of the Tassie tiger (*Thylacinus cynocephalus*) by extracting DNA from the hair of two museum pieces. Hair is like a shrine for DNA – a time capsule that's so well sealed that air, water and bacteria cannot penetrate the DNA stored inside.

'Our goal in doing this is to learn how to prevent endangered species from becoming extinct,' said Webb Miller, a Penn State professor and a member of the research team that includes scientists from the US, Sweden, Spain, Denmark, the UK and Germany.

The two tigers examined had near identical DNA, suggesting there was very little genetic diversity in the species prior to death of the last known Thylacine in 1936. This similarity means that the species was probably vulnerable to bacterial and other environmental stresses, although it was hunting that finally drove it out of existence.

Researchers want to use this information

to help in the fight against the Devil Facial Tumour Disease (DFTD).

'While initial screening of only a few animals with maternal genetic markers suggests a low genetic diversity in the Tasmanian devil, we hope to soon have a better idea on the overall diversity by studying a cohort of animals with a larger panel of autosomal markers derived from the genome project,'

said Stephan Schuster, another Penn State professor and member of the research team.

'We've now directed a portion of our research program to studying the Tasmanian devil. We're trying to find the genetic differences between them so we can use

this information for pedigree selection. We will tell breeding efforts which animals they have to breed to produce the most genetic diversity possible.'

The research paper, 'The mitochondrial genome sequence of the Tasmanian tiger (*Thylacinus cynocephalus*)', was published in the January 2009 online edition of Genome Research (www.genome.org).

More information on the Tasmanian Tiger Sequencing Project can be found at <http://thylacine.psu.edu>



Tasmanian tiger, now extinct.
Collection: Tasmanian Museum and Art Gallery.

Continued page 3... 'Extinct' still means forever.



Australian Government



SAVE THE **TASMANIAN DEVIL**
www.tassiedevil.com.au



Welcome

The Save the Tasmanian Devil Program's mainland Insurance Population has increased to 145 animals. This total includes 30 Tasmanian devils sent to mainland wildlife parks over the past summer, as well as 47 devil joeys produced over the past two breeding seasons.

The Insurance Population is the cornerstone of our Program. In time, it may also prove central to the survival of the species in the wild.

So what makes the Insurance Population so important? In short, the devils in this breeding program could play an important role, if ever needed, in helping re-establish healthy wild populations in Tasmania.

To date, state-wide devil numbers have declined 70 per cent since before DFTD was first observed (1996), and the disease has been recorded across more than 60 per cent of Tasmania.

Animals in the Insurance Population were gathered from areas of the State where there hasn't been evidence of DFTD, and initially housed in purpose-built quarantine enclosures. They were then sent to mainland wildlife institutions, approved by the Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA), far away from the devil disease.

To date, the mainland parks that are part of the Insurance Population include: Adelaide Zoo (SA), Australia Zoo (QLD), Australian Reptile Park (NSW), Ballarat Wildlife Park (VIC), Cleland Wildlife Park (SA), Currumbin Wildlife Sanctuary (QLD), Dreamworld (QLD), Halls Gap Wildlife Park and Zoo (VIC), Healesville Wildlife Sanctuary (VIC), Lone Pine Koala Sanctuary (QLD), Monarto Zoological Park (SA), National Zoo and Aquarium (ACT), Pearcedale



Tiffany Eastley from the Healesville Sanctuary in Victoria and Jocelyn Hockley of the Save the Tasmanian Devil Program with a devil for export to the mainland.

Conservation Park (VIC), Perth Zoo (WA), Taronga Zoo (NSW) and Western Plains Zoo (NSW).

The current mainland Insurance Population is large enough to retain 95 per cent of the genetic variation found in the wild for 50 years, but it will require periodic immigration.

If the situation in the wild deteriorates and it's no longer possible to occasionally supplement the mainland Insurance Population, ARAZPA has advised that the Save the Tasmanian Devil Program will need an effective population size of around 500 breeding devils to indefinitely maintain the species' genetic diversity. This may mean having as many as 1,500 devils being intensively managed in captivity – a massive task.

While zoo-based populations may be sufficient to indefinitely maintain the species, we also want to develop options that may assist in maintaining as much natural behaviour as possible in a captive setting.

Free-ranging enclosures, which don't require intensive management, are certainly one option that has great potential. There's very little known about managing Tasmanian devils in

this way, so we're working through some issues relating to the size of the enclosures, the numbers and ratio of animals that we house, den construction, food sources and, of course, breeding.

Meanwhile, there was a recent setback in our research into animals that may be resistant to DFTD. A west coast devil that we called Cedric – which had previously produced an immune response to the disease – eventually developed two facial tumours.

Researchers continue to explore whether there are any resistant animals, and the possibility of developing a tool that allows us to identify these individuals.

The disappointment with Cedric is just another reminder that it will take a series of interlinked conservation activities, such as our Insurance Population and disease management in the wild, if we are going to save the Tasmanian devil. We remain confident that tackling this disease on a number of fronts will ultimately ensure the survival of the species.

P.S. We were relieved to hear that Healesville Sanctuary escaped the full horror of the recent Victorian bushfires.

Healesville transferred many of their populations of threatened species to Melbourne Zoo and Werribee Open Range Zoo. The Australian Wildlife Health Centre at Healesville remained open to care for critically injured wildlife.

Sadly, many, many others were not as fortunate. Everyone at the Save the Tasmanian Devil Program would like to say that our hearts are with those who lost their life, family members, friends and/or property.

**Andrew Sharman, Manager,
Save the Tasmanian Devil
Program.**

'Extinct' still means forever

...from cover page

The goal of the research into the hair samples of the Tasmanian tiger was clearly to prevent endangered animals from becoming extinct. In short, it's a lesson for modern conservation efforts.

'However, I am expecting that publication of this paper will reinvigorate discussions about possibly bringing the extinct Tasmanian tiger back to life,' said Prof. Webb Miller, a member of the research team.

He was right! The research was picked up for speculation about whether we might be able to reverse the fate of lost species.



Prof Webb Miller

But there is a danger in believing that extinction may not mean forever, warns Nick Mooney, a wildlife biologist with the Save the Tasmanian Devil Program and an authority on the Thylacine.

'We're surrounded by a range of species that today are vulnerable or threatened,' Nick said.

'Our focus needs to be on protecting these animals while we still have them, rather than trying to resurrect a species that may never be more than a freak show. Any of these individuals could only have the super-low genetic diversity of the animals they were cloned from, and would be too valuable and fragile to release.'

Sheltering devil dens

The protection of Tasmanian devil dens – particularly in areas where the population has been decimated by the Devil Facial Tumour Disease (DFTD) – is becoming a planning feature of fuel reduction burns by Parks and Wildlife Service Fire Management Officers.

In the lead up to summer, Parks' fire crews discussed devil den requirements with Dr David Pemberton, the Program Leader for Wildlife Conservation within the Department of Primary Industries and Water and co-author of the book 'Tasmanian Devil: A unique and threatened animal'.

David took an on-site survey of a proposed burn area in the north-east of the State, to locate devil dens and to discuss the impact of fire on such sites.

It was at Mt William, in the State's north-east, that DFTD was first reported. In the decade since, that devil population has declined by 94%.

'Maternity and copulation dens are crucial in the management of depleted devil populations,' David



Maternity and copulation dens are crucial in the management of depleted devil populations.

said. 'And Spring is an even-more important time, because it's when females will be caring for young.'

'So we're helping fire crews to understand the den requirements of devils, and how to locate these dens. We're also discussing the ways we can minimize the impact of burns on these sites.'

Practical planning options, such as looking after maternity dens, gives all land managers ways they can help Tasmanian devils. So Steve Summers, the Parks and Wildlife Service's Fire Management Officer, Northern Region, said that the fire crews were eager to tread cautiously with their spring burns.

'The on-ground management of threatened devil populations is vital,' he said.

'There's been a lot of work done into understanding the devil disease. Well, the management in the field of compromised populations is equally as important. We need to look at everything that poses a threat to devils, including roadkill and wildfires'.

Devil island funding

Three more free-range enclosures will be constructed to house Tasmanian devils from the Insurance Population, under a partnership between the Save the Tasmanian Devil Program (STTDP) and the Devil Island Project.

Up to \$400,000 will be provided by the STTDP, to be added to the funds already raised by the Devil Island Project.

The first Devil Island was opened last year, on the State's east coast.

Andrew Sharman, manager of the STTDP, said free-range enclosures had been identified as an important component of managing the insurance animals.

'The partnership with Devil Island provides an important opportunity to enhance the number of animals in the Insurance Population, in a less-intensively managed environment,' he said.

The story so far

- Devil Facial Tumour Disease (DFTD) is a contagious cancer that spreads between individuals through biting. Small lumps in and around the mouth develop into large tumours on the face and neck. Once the cancer becomes visible, death invariably follows, usually within months.
- The foreign cells of the tumour aren't rejected by the individual's immune system because of a lack of genetic diversity among Tasmanian devils.
- The Tasmanian devil population has declined by more than 70 per cent since before 1996, when the first signs of the disease were observed in the State's north-east. DFTD has been confirmed at 64 locations across more than 60 per cent of Tasmania, although there's no evidence that DFTD has yet reached the far west of the state.
- DFTD is mutating in the wild, with nine strains of the disease so far identified.
- The Tasmanian devil is listed as 'Endangered' under the Tasmanian Government's Threatened Species Protection Act 1995, and 'Vulnerable' under the Australian Government Environment Protection and Biodiversity Conservation Act 1999.
- The Save the Tasmanian Devil Program is the official joint strategy of the Australian and Tasmanian Governments. It features the Insurance Population, collaborative laboratory-based investigations of the disease, and disease-suppression programs of wild populations.



A message from the Governor of Tasmania

It is hard to conceive of a Tasmania without the Tasmanian devil as it has become an integral part of our culture. Internationally, the State is synonymous with the devil.



Peter Underwood.

The Save the Tasmanian Devil Program, a joint program funded by the State and Federal Governments, has my full support. I urge everyone to get behind the effort to discover a cure for the tumour which is threatening this unique animal's existence.

I commend all those who have already taken up the challenge: those undertaking research both in the laboratory and in the field; those working on the establishment and operation of secure breeding stations; and those who have embarked on an astonishing number of inventive fund raising and educational projects.

You don't need to be a scientist or a wildlife expert to play a role in the survival of the devil. We can protect the existing population simply by driving with care and being aware of wildlife active areas. We can provide financial support, both through direct donation and by supporting those businesses and enterprises which have assigned part, or in some cases all of their profits to the cause.

I sincerely hope that some day, in the not too distant future, I have the pleasure of sending a message of congratulations on the occasion of the announcement of the discovery of a cure to this disease. But this will not happen without the support of the whole community. I urge everyone to get involved in this program in one way or another, no matter how small your contribution may seem.

***His Excellency The Honourable
Peter Underwood AO,
Governor of Tasmania.***

Save the Tasmanian Devil Appeal



The formal fundraising arm of the Save the Tasmanian Devil Program is administered by the UTAS Foundation. The Appeal has raised more than half a million dollars in corporate and public support. All donations are directed IN FULL towards research and management programs endorsed by the Save the Tasmanian Devil Program. Donations are tax deductible.

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Devilish folk

The diversity of expertise among members of the Save the Tasmanian Devil Program plays an important role in furthering our knowledge. Our quarterly newsletter gives us the opportunity to introduce members of the team.

Sam Fox

Dr Samantha Fox, the newest member of the Save the Tasmanian Devil Program's trapping team, has a doctorate in zoology, as well as years of field experience in Africa, PNG and tropical Australia. But when she first came face to face with the suffering caused by the Devil Facial Tumour Disease (DFTD), she felt tears streaming down her face.

'I remember seeing one animal that had a very advanced stage of the devil disease,' Sam said. 'He had trouble breathing because of the tumours all around his face and in his lungs. It was very upsetting.'

'Later, everyone gave me a hug and said it's common for people to cry the first few times they see a devil with an advanced case of the disease, especially if it's a female devil with pouch young. You know that she may not live long enough to raise them.'

With Sam's academic qualifications, she could call herself a zoologist, or a scientific officer, or even an ecologist. Instead, she describes



Dr Samantha Fox

herself as a conservation biologist because she's keen to be involved in research that directly helps animals.

Her doctorate focused on a species of flying fox that's listed as vulnerable, and conservation is also part of the reason that Sam joined the Devil Program, moving down from mainland Australia.

'Many people compare what's happening with the Tasmanian devil with the Thylacine because they're both so iconic,' she said.

'But the bigger picture is that

the devil is Tasmania's biggest marsupial carnivore. Without the devil, the ecology of Tasmania could completely change – especially since the Wedge-tailed eagle, Tasmania's other big carnivore, is also threatened.

'Anyone who knows anything about ecology can tell you that carnivores are at the top of the trophic pyramid. Without them holding everything together, the ecological structure changes. For example, one of our biggest worries with a decline in devils is an increase in feral species such as foxes and cats.'

But what the textbooks can't tell you, Sam added, is the breathtaking beauty of Tasmanian devils when you see them up close. Pictures just don't do them justice!

'We catch devils in the middle of the day, so they're usually asleep when we open the traps,' she said. 'They're groggy and terrified, and they don't move a muscle while we check them for signs of DFTD. Their huge eyes just stare up at you.'

'For an animal that has such a reputation for being ferocious, it seems remarkable to me that they're actually so placid. But then again, they're unique in every way. There's nothing that even comes close to them.'

Top of the class

The big-hearted kiddies from Kindergarten/Year 1 at Concord West Public School in NSW recently produced some colourful reports on Tassie devils.

Upset to learn that the devil is now an endangered species, the students (as well as their parents and teacher) held a cake stall to support this uniquely Australian animal.

They raised \$210.25 for the Save the Tasmanian Devil Program, and delighted us all with their wonderful pictures.



Close shave

One of the world's most prominent computer software engineers has exchanged the mouse for a razor in support of the endangered Tasmanian devil.

Linux creator, Linus Torvalds, shaved the beard of Hewlett-Packard Chief Technologist, Bdale Garbee, as part of a \$25,000 auction pledge at the Linux national conference, held last January.

'We love nature and our family has experienced Tasmania's outdoors,' said Bdale, who'd had a beard for 27 years. 'So we are thrilled to be raising money for the Tasmanian devil.'

Close to \$40,000 was raised at the Linux National Conference's charity auction and Penguin Dinner. It's the first time that Hobart has hosted linux.conf.au – one of the world's premier technical conferences.

'But the delegates were aware of the threat of the Devil Facial Tumour Disease, and were eager to help,' said conference organiser, Ben Powell.

'Our mascot, Tuz, is a devil masquerading as Tux the Linux Penguin. We're donating \$5 per Tuz toy that was sold at the conference, on top of the money raised at the auction.'



Linux.conf.au began in 1999 with the Conference of Australian Linux Users.



Linux creator, Linus Torvalds, shaves the beard of Hewlett-Packard Chief Technologist, Bdale Garbee.

The Taste festival



A devil trap demonstration (top) and devil sculpture (right) at The Taste festival.



A giant Tasmanian devil sculpture, made from bamboo and recycled materials by installation artist Amanda King, was a feature of the Taste Festival in Hobart over the 2008-09 period.

Nearby, representatives of the University of Tasmania and Soroptimist International (Hobart) manned a stand to sell Biscottelli gourmet biscuits, Tasmanian Icon Wines, and the Devilishly Delicious recipe books – all to raise money for Tasmanian devil research.

The Taste Festival is a celebration of contemporary Tasmanian produce through epicurean delights, artists and performers.

Devil worshippers at Soundscape

The Soundscape Festival rocked the Hobart Regatta Grounds in January and, at the same time, raised money for the Save the Tasmanian Devil Appeal.

The organisers pledged \$1 from the sale of every ticket to the all-age event, which featured local acts Let The Cat Out and The Frets, as well as big-name bands like Pnau, Cut Copy, and British India.

More than \$1,000 had also previously been raised at the Soundscape Showcase playoffs, held last December.

For more information on the Soundscape Festival, go to:
www.thesoundscapefestival.com

Black and White Day

Don't forget that the third annual Black and White Day will be held in schools and workplaces across Australia on Friday May 15.

Young and old alike are being encouraged to make a gold coin donation in exchange for the chance to wear black and white clothes for the day.

Black and White Day events will be held across Australia. In fact there's so much that Nature Nic Bonnitcha – the 10-year-old Tasmanian schoolboy who came up with the fundraising idea – has launched a new website: www.blackandwhite.day.com.au

SAVE THE TASMANIAN DEVIL newsletter

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