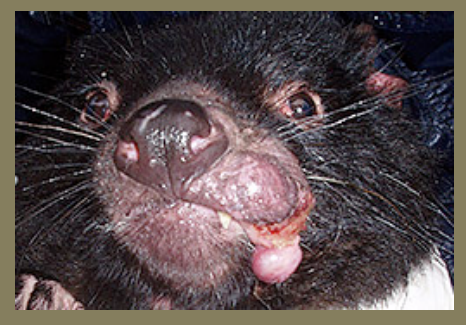


Tasmanian devils with large facial tumours were photographed in north-east Tasmania during 1996. A decade later, we know these characteristics are consistent with Devil Facial Tumour Disease (DFTD) - a fatal condition in Tasmanian devils, characterised by cancers around the mouth and head. As at December 2006, the Tasmanian devil disease had been confirmed at 60 different locations across 59% of Tasmania's mainland.

### What we know about the disease

The Tasmanian devil disease appears to be a new condition that is restricted to Tasmanian devils. No affected animals were reported among the 2000-plus Tasmanian devils trapped by wildlife biologists between 1964 and 1995.



Once the cancer becomes visible, it appears to prove fatal within several months. Small lesions, or lumps, in and around the mouth quickly develop into large tumours on the face and neck (and sometimes other parts of the body). Tasmanian devils with facial tumours find it difficult to eat. Death results from starvation and the breakdown of body functions.

Nearly all the Tasmanian devils that succumb are between two and three years of age.

### Mapping the spread of the disease

Trials are underway examining the transmission of the Tasmanian devil disease. Preliminary results support the growing scientific acceptance that the infective agent is a rogue cell-line passed between devils by allograft. Put more simply, we are getting more and more evidence that the disease is spread by the cancer cells themselves passing on from one animal to another.



For this reason, cases continue to occur in areas where the disease had not previously been recorded. Across Tasmania, there has been a 53% decline in average sightings from 1992-95 to 2003-06. In the north-east region, where signs of the Tasmanian devil disease were first reported, there has been a 89% decline of average spotlighting sightings from 1992-95 to 2002-05.

It is uncommon for wildlife diseases to lead directly to population extinction in the absence of other severe threats. But as at December 2006, there had not been any evidence of population or individual resistance or recovery from the disease.




There are concerns that the drastic fall in population may allow introduced predators such as feral cats and foxes to move into the Tasmanian devil's niche. If this occurs there could be a wider impact on Tasmania's unique wildlife.



Map showing known distribution of DFTD in Tasmania (December 2006)

## Noah's Ark


Currumbin Wildlife Sanctuary announced in April 2007 that one of the Tasmanian devils from our captive breeding "insurance" population was carrying up to four young in its pouch. This animal belonged to one of two shipments of 'Project Ark' Tasmanian devils – 48 animals in total – that were sent to four mainland wildlife parks during December '06 and January '07. Interstate parks were chosen because of the mainland's freedom from the Tasmanian devil disease. The animals in the insurance population had been gathered from areas of the State where there has not been evidence of the disease. They are spending a further year in quarantine in their new homes. While the delightful news of the breeding success in Currumbin is encouraging, still more needs to be done to benefit conservation of the Tasmanian devil. So 30 young Tasmanian devils have been captured from north-west Tasmania, from areas that still seems to be free of the disease, to be used in one or other "insurance" strategy. It has not been decided as yet what will be done with these devils. The possibility of establishing a population on one of Tasmania's offshore islands is currently being investigated. As there are currently no Tasmanian devils on any of the islands, the strategy requires careful assessment of all potential risks, as well as potential benefits.

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## Latest update

The scientific forum held in Hobart during February 2007 provided an opportunity for a wide range of wildlife biologists, disease experts and other scientists involved in research projects to evaluate what has been learned about the disease so far and identify actions for the future. Talks ranged from what has been learned from investigations of the disease itself, to outcomes of trials and management actions, to the flow on effects of a declining devil population. Information discussed at the forum will be used to help develop the actions for the program into the future. The forum resulted in a general consensus that the disease that threatens the devil is a new and lethal form of transmissible cancer; and that extinction of the Tasmanian devil in the wild is a real possibility. There was agreement that disease-free devils must be maintained as an "insurance" against loss of wild devils, and that these "insurance" devils will be maintained as captive managed breeding populations in zoos outside Tasmania, and may also be isolated from disease on islands and within fenced areas. It is time to move from the initial investigation phase, and focus even increasingly on active disease management.

A series of public presentations is planned during 2007 to provide the wider community the opportunity to hear directly from scientists involved in projects aimed at conserving the species in the wild.

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## A contagious cancer



The Devil Facial Tumour disease is a remarkable cancer as it is one of only three recorded cancers that spread like a contagious disease. Under normal circumstances cancer cannot be "caught" as the cancer cells from one host are completely different to the next host and should be rejected by the immune system.

Since DFTD breaks this rule, there are many questions which need to be answered to explain how this cancer can be spread from devil to devil. One of the most important questions relates to their immune system.

Researchers at the Menzies Research Institute, led by Associate Professor Greg Woods, are currently undertaking studies to investigate whether Tasmanian devils have a fully functional immune system. PhD student, Alex Kreiss (pictured above), has taken many blood samples from Tasmanian devils and subjected these samples to laboratory tests of immune function, similar to tests that are performed in normal pathology laboratories that investigate human blood samples. Alex has shown that our Tasmanian devils do have a good immune system as they have the correct mix of white blood cells and the lymphocytes, the key cell in the immune system, function normally.

These laboratory tests were then extended to analyse the immune response of the Tasmanian devil directly. This required injection of red blood cells under the skin of a number of Tasmanian devils. This was performed with the assistance of experienced veterinary surgeon, Dr Barrie Wells. Results of these studies were even more conclusive confirming that Tasmanian devils have a functional immune system as the devils rapidly produced antibodies in response to the foreign red cells.

We are therefore confronted with the perplexing problem that DFTD can develop in animals with a fully competent immune system. This is an immunological conundrum and further investigations were undertaken to determine why the devil facial tumour cells are not recognised by the immune system. The devil to devil transmission suggests that this cancer is similar to a transplant, but rather than a transplant of a life saving organ such as a heart or kidney, the transplant is a life threatening cancer.

Mixed lymphocyte reactions were then undertaken to investigate whether the Tasmanian devil has the correct genes to allow recognition of foreign cells. This was performed by mixing lymphocytes from many devils to see if they reacted to each other. The results from these studies clearly showed that devils failed to recognise cells from other devils as different. This provides strong evidence that a lack of genetic diversity contributes to why the cancer is infectious. Therefore when a healthy devil is infected with a devil facial tumour from another animal, the infected devil's immune system assumes that the new cancer cells are the same as its own cells and will not reject it.

The daunting task ahead is to learn how to persuade the devil's immune system to recognise the cancer cells as hostile infectious agents, which will then alert the devil's immune system to destroy these cancer cells.

## Frequently asked questions

### **Q: Do you treat the Devil Facial Tumour Disease in individuals?**

**A:** Treatment hasn't yet been trialled for the following reasons: Initially we needed to make the best use of available resources by investing time into the study of the disease.

Most importantly, if a cure for this disease is found, we need to be able to use it from a wildlife management point of view rather than on individual animals - we want to keep the devils wild and in the wild.

Surgery and chemotherapy would be difficult, if not impossible, to implement from a population point of view. Nevertheless, nothing is ruled out that may help to save the devil, and research is proposed to investigate the possibility and feasibility of cancer treatment for devils in some limited situations.

### **Q: Can the Devil disease spread to other animals?**

**A:** The Mount Pleasant Laboratories, in Launceston, are the only animal health laboratories in Tasmania, and handle all cases concerning farmed and wild animals. To date, they have found no evidence of the Tasmanian devil disease in other animals.

The field team is running surveillance with many traps and has caught many species that showed no clinical signs of the disease. Species include possums, quolls, cats and even a sausage dog.

### **Q: How do Tasmanian devils catch Devil Facial Tumour Disease (DFTD)?**

**A:** Trials are underway to examine the transmission of the Tasmanian devil disease. Preliminary results support the increasingly accepted hypothesis that we are dealing with a transmissible cancer and that cancerous cells are passed directly between devils as an allograft. Put more simply, we are getting more and more evidence to support the theory that DFTD is spread by the cancer cells themselves being passed from one animal to another.

### **Q: If there are still thousands of Tasmanian devils left in the wild, then how can they be classified as 'vulnerable to extinction'?**

**A:** Across Tasmania, there has been a decline of more than 53% in average sightings per spotlighting survey route from 1992-95 to 2003-06. In the north-east region, where signs of the Tasmanian devil disease were first reported, there has been a 89% decline of average sightings from 1992-95 to 2002-05. Because of this alarming rate of decline, Tasmanian devils have listed as vulnerable to extinction under the State's *Threatened Species Protection Act 1995*. They have also been included by the Federal Government under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*. It's hard for us to know exactly how many Tasmanian devils remain in the wild, but our best estimate is between 20,000 - 50,000 mature individuals (which is assumed to be about half the overall numbers). One of the reasons why it's difficult to be more precise is that there are population number estimates for only a few places across the State. Good estimates for anywhere in the World Heritage Area, for instance, aren't available because there are no roads and it's hard to check traps on a daily basis. As with all our information, we are reviewing these figures as we learn more, so they may change.

## Would you like to know more?

See the [Science of Devil Facial Tumour Disease](#) information on the Tasmanian Department of Primary Industries and Water website.

View a [movie on the Tasmanian devil](#) and the race to prevent its extinction.

## Recent And Significant Scientific Publications

### **A case definition of Devil Facial Tumour Disease - November 2006**

Tasmanian Department of Primary Industries and Water (DPIW) veterinary pathologist Dr Richmond Loh, in conjunction with Murdoch University, published a case definition of the Tasmanian devil disease in the November edition of Veterinary Pathology ([Abstract](#)). The publication reported that there was little difference in the tumours across their range, that they affect both male and female animals equally, and that they are very aggressive local cancers that have metastasised in more than 60% of cases.

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### **The origin of tumour cells - November 2006**

Research into the origins of the tumour cells by DPIW veterinary pathologist, Dr Richmond Loh, in conjunction with Murdoch University, was published in the November edition of Veterinary Pathology ([Abstract](#)). This research supports the hypothesis that the cells are of neuroendocrine origin. Although DFTD was once thought to be a variant of lymphosarcoma, and a retrovirus was considered a possible cause, this research provides evidence to the contrary.

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### **Managing an emerging disease threat - October 2006**

The [Public Library of Science Biology](#) recently published the work of Dr Menna Jones and Professor Hamish McCallum of the University of Tasmania. Their paper uses the Devil Facial Tumour Disease as a case study on managing an emerging disease threat. It highlights the need to make management decisions with imperfect knowledge and the importance of continuously managing the known risks. The paper examines the range of options for managing

the disease threat.

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**The impact and distribution of the Tasmanian Devil Facial Tumour Disease - July 2006**

The August 2006 edition of Biological Conservation, (available online from Science Direct

[www.sciencedirect.com](http://www.sciencedirect.com)),

published research by scientists from a range of institutions, co-ordinated by DPIW wildlife biologist Clare Hawkins. The research brought together results from all the field monitoring that has been undertaken as part of the program. It also combined data from annual spotlighting surveys over the last decade, and historical records of devil trapping, to give an overall picture of the changing distribution of Devil Facial Tumour Disease and its impact on Tasmanian devil populations.

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**Clones transmitted by allograft - February 2006**

Senior cytogeneticist with the Department of Primary Industries and Water (DPIW), Anne-Marie Pearse, and her assistant, technician Kate Swift, published ground-breaking research on the Tasmanian Devil Facial Tumour Disease (DFTD) in the world's pre-eminent peer-reviewed science journal, [Nature](#). The paper establishes with a high degree of certainty that devil facial tumours are clones transmitted by allograft. Allograft is where tissue is transplanted from a donor of the same species, but different genetic make-up, without the recipient's immune system rejecting the graft. This is an exceptionally rare occurrence.

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**[Full list of recent scientific publications](#)** (PDF, 25 KB)

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**Newsletters**

Newsletters produced by the Devil Facial Tumour Disease Program will keep you informed about the progress being made in response to the disease.

[May 2007](#) (PDF, 752 KB)

[February 2007](#) (PDF, 897 KB)

[December 2006](#) (PDF, 621 KB)

[March 2006](#) (PDF, 906 KB)

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### **Research and Scholarship Grants**

The University of Tasmania Foundation nominates and allocates a number of scholarships and research grants bi-annually through the Tasmanian Wildlife Research Advisory Committee (TWRAC) for research into the facial tumour disease currently devastating Tasmanian devil populations. (Information on recent recipients is available on our [Schools page](#).) These awards are funded from public donations received through the Tasmanian Devil Research Appeal Fund. They support key research areas approved by the Devil Facial Tumour Disease Steering Committee, which was formed after the October 2003 workshop of scientists and animal health experts from institutions and organisations throughout Australia. More information on the awards and application process is available from [www.utas.edu.au/devilappeal](http://www.utas.edu.au/devilappeal)

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### **Latest Spotlighting Data**

Each year the Department of Primary Industries and Water undertakes "spotlighting" surveys of a number of native species around the State. These surveys provide an opportunity to understand whether populations of particular species are increasing or decreasing across the State and in particular areas. Having been conducted over many years, the spotlight data on Tasmanian devils provides an opportunity to understand the declines that have occurred since the emergence of the disease. As previously highlighted in research coordinated by Dr Clare Hawkins from DPIW, there had been a Statewide decline of more than 40 per cent in average sightings per spotlighting survey route from 1992-95 to 2002-05. Incorporation of the latest 2006 spotlighting data into this analysis indicates that the devil population is continuing

to decrease Statewide. Latest estimate of the decline in Tasmanian devils since the first report of the disease (spotlighting survey results compared from 1992-95 to 2003-06) shows the Statewide decline in sightings is now 53 per cent. In specific areas where the disease has been recorded for longest the declines are more dramatic. For example in the north east, where the disease was first reported, the sightings have declined by 89 per cent from 1992-95 to 2002-05.

#### **CSIRO Scientific Research - May 2007**

CSIRO scientists have joined the battle to save Australia's iconic Tasmanian devils from the deadly cancer devastating the devil populations. Researchers from CSIRO's Livestock Industries Australian Animal Health Laboratory (AAHL), Textiles and Fibre Technology and Land and Water are working together to hunt down the cause of the Devil Facial Tumour Disease (DFTD) and to establish how far the disease has spread. The integrated research group at AAHL will use a variety of techniques including microscopy, microarrays and a range of molecular techniques to search for infectious agents, markers for disease and to determine where the tumour originates from. "We will be working in a number of areas including establishing whether a virus or other infectious agents are associated with the tumours," AAHL's Dr Alex Hyatt, said. "If successful the establishment of pre-clinical tests will allow researchers to remove known infected devils, in turn limiting the spread of the disease." Dr Jeff Church, a chemist and Spectroscopist at CSIRO Textiles and Fibre Technology, is investigating the Tasmanian devil's hair to determine if any chemical or structural changes can be detected that can be correlated with the disease. "We are hoping we can work together to develop a pre-clinical diagnostic test based on recent developments in



the diagnosis of human breast cancer," Dr Church said. "Such a test would enable the screening of captured animals prior to their release into the wild or placement into isolated breeding populations." Mr Steve Marvanek, Spatial Data Analyst at CSIRO Land and Water, recently integrated historical wildlife spotlight data, devil monitoring data and geo-referenced reports of diseased devils into a geographical information system (GIS) to map the spatial and temporal distribution of the disease across Tasmania.



This website is a joint initiative of the Tasmanian Government and University of Tasmania. We gratefully acknowledge our [supporters](#).

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