



THE EASTERN QUOLL

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The eastern quoll (*Dasyurus viverrinus*) is an endangered medium-sized carnivorous marsupial that was once widespread throughout south-eastern Australia, but now survives only in Tasmania. Populations on the Australian mainland declined rapidly around the late 1800s and early 1900s, apparently due to a disease epidemic that reportedly affected a number of native species at that time. To add insult to injury, quolls were regularly poisoned and persecuted for killing domestic poultry, further contributing to their decline. The introduction of the European red fox as a novel predator was likely the final straw in their mainland demise, with the eastern quoll now considered extinct on the mainland.

In contrast to its mainland extinction, the eastern quoll continued to thrive in Tasmania where it was, until recently, considered stable and secure. However, the species has recently undergone rapid and severe population decline across the Tasmanian mainland, although North Bruny Island still supports an isolated stable, high-density population. A

combination of trapping and spotlight surveys indicated statewide declines of more than 50 percent in the 10 years to 2009 with no sign of recovery.

Between 2010 and 2014, I investigated the possible causes of the eastern quoll's decline in Tasmania. In-depth weather modelling revealed that fluctuations in quoll abundance were related to changes in short-term weather across the species' range, including a sharp decline between 2001 and 2003. It seems eastern quolls prefer it cold and dry, and don't do so well when it's warm and wet! But while weather conditions improved after 2004, quoll numbers did not recover. So while unfavourable weather conditions pushed the quoll numbers down, something else is now keeping them down and preventing them from recovering. But what?

An investigation into *Toxoplasma gondii*, the cat-borne parasite that causes the disease toxoplasmosis, found a high prevalence of the parasite in populations where quolls had declined, but a low prevalence in quoll

populations that were stable. At first glance, this suggested that the parasite might have been contributing to the low quoll numbers, or preventing them from recovering. But further investigations revealed that the parasite did not affect either quoll survival or reproduction. As the parasite is primarily spread by cats, the high prevalence at declined quoll sites actually signalled a higher cat density at these sites, suggesting that feral cats may be suppressing quoll recovery through predation of quolls, or competition for key resources.

So I cast the net a bit wider across Tasmania to better understand the relationship between cats and quolls. I performed camera surveys at 16 sites across Tasmania, and analysed how quolls responded to different abundance and activity of cats. I predicted that areas with low quoll numbers would have more feral cats than areas with

Above: Black and tan eastern quolls were once thought to be two different species, but they are just like the blondes and the brunettes of the quoll world.



Reproduction success still appears high, with nearly all quolls carrying a full compliment of six pouch young.

high quoll numbers. But to my surprise, there was actually no relationship between cat and quoll abundance.

However, the species activity profiles revealed more interesting results. Quolls were strictly nocturnal, with activity peaking in the first couple of hours after sunset each night, regardless of season. But cats changed their activity times quite dramatically between seasons. In winter, cats were mostly active during the afternoon, concentrating their activity in the hours just before sunset. But in summer, cats were more active at night, increasing the chance that a quoll will run into a cat. Unfortunately, summer is the time of year when juvenile quolls first emerge from their natal dens as independent little fluff balls. With cats being most active at this time, the predation risk is much higher for these small, naïve juvenile quolls. Indeed, trapping results revealed that very few juveniles entered the population in areas where quolls had declined, whereas sites with stable populations had a surge in juveniles over summer.



Quolls were trapped using PVC devil traps.

While cat predation of juvenile quolls has likely been occurring for hundreds of years, quoll populations have historically been high enough to withstand the loss of a few juveniles, without any negative effects at the population level. However, with quoll populations currently at much lower densities, the loss of only a few juveniles is now enough to prevent populations from recovering.

So it seems that a period of unsuitable weather reduced quoll populations to an unprecedented low abundance, and that populations are now too small to withstand threats, such as cat predation, to which they were robust when at higher densities. The inability of eastern quoll populations to recover does not appear to have resulted from any new threat, or even an increase in threat intensity, but rather an inability to reproduce fast enough to overcome existing levels of threat and achieve a positive population growth from their current low densities. Eastern quolls are now trapped in a 'predator pit', and recovery is unlikely without management intervention.

Bronwyn Fancourt was awarded grants from the Australian Wildlife Society in 2010 and 2011 for her honours and PhD research investigating the cause of decline of the eastern quoll in Tasmania. More recently, Bronwyn worked at the Mulligans Flat Woodland Sanctuary in the ACT, and is currently working in Queensland researching ways to improve feral cat management in eastern Australia.



The spots on an eastern quoll are as individually unique as fingerprints on humans.



Eastern quolls are bold around people and can often be seen scavenging on food scraps around car parks and camp grounds.



It's standing room only in Mum's pouch as the young reach 60 days of age.