Predation by foxes and cats, the ubiquitous threat to biodiversity conservation in Australia. Is it made worse or ameliorated by mesopredator release?

Paul de Tores, Nicky Marlow, Dave Algar, Keith Morris, Al Glen, Duncan Sutherland and Oliver Berry

Western Australian Wildlife Research Centre, PO Box 51, Wanneroo, WA, 6946, paul.detores@dec.wa.gov.au

Predation of native fauna by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*) is listed by the Commonwealth of Australia's *Environment Protection and Biodiversity Conservation Act, 1999* as a key threatening process. In recognition of this, The Western Australian (WA) Department of Environment and Conservation (DEC) and its predecessor, the Department of Conservation and Land Management, implemented broad-scale aerial and ground based baiting for fox control. The operation was based on research which clearly demonstrated a suite of native species would increase in abundance in response to fox control. DEC's 'Western Shield Introduced Predator Control and Fauna Recovery Program' is the umbrella program for fox control in WA.

The initial benefits from fox control were dramatic and culminated in the delisting of three threatened mammal species, the woylie or brush-tailed bettong (*Bettongia penicillata*), tammar wallaby (*Macropus eugenii*) and quenda, or southern brown bandicoot (*Isoodon obesulus*). Translocation of a suite of threatened mammal species also indicated initial success.

Despite ongoing baiting of large tracts of conservation estate, many of the initial fauna recoveries and translocation successes were not sustained. In 2009 the iconic woylie was again listed as a threatened species. Various hypotheses were proposed to explain these declines but none is universally accepted and a combination of causal factors is likely. However, there was strong evidence that predation by cats increased when fox density was reduced. This phenomenon is well documented in ecological theory and is known as mesopredator release. The reduction in density of the dominant predator (the fox in south-west WA) releases one or more subordinate predators (mesopredators) from competition. The results of this 'release' can include increased abundance and/or changes in the behaviour of the subordinate predator(s). In south-west WA, species potentially released from competition with foxes include the feral cat and native predators such as goannas (*Varanus rosenbergi* and *V. gouldii),* chuditch (*Dasyurus geoffroii*) and the south-west carpet python (*Morelia spilota imbricata*).

To confirm if mesopredator release of cats was occurring as a result of fox density reduction and if this was contributing to fauna declines, a collaboration was established between the Invasive Animals Cooperative Research Centre (IA CRC), DEC and the Australian Wildlife Conservancy (AWC). The project is comprised of four study sites – the rangelands (Mt Gibson and the former pastoral leases of Lochada and Karara), the northern jarrah forest, Dryandra Woodland and Lake Magenta Nature Reserve. Achieving the objectives required modification of existing techniques and development of a range of new ones, including methodologies to estimate population densities of foxes, cats and goannas, and broad-scale use of hair collecting devices to identify individual foxes and cats from DNA extracted from the collected hair.

The collaboration has enabled the project to meet its major objectives. A refined sandplotting techniques now allow us to estimate fox and cat density instead of relying on simplistic unquantified "indices of activity". Hair collection devices have been developed and enable collection of fox and cat hair from a single device. Genotyping of the DNA recovered from hair and scat samples has shown fox populations are being "turned over" (i.e. individual foxes are successfully removed by baiting, but are replaced by immigration). Genotyping from hairs has confirmed the feral cat bait ERADICAT® is effective in controlling both introduced predators in

the rangelands. Mesopredator release of cats in the presence of fox control has been confirmed at the northern jarrah forest site and at Lake Magenta. Genotyping to identify the predator species and the individual predator has confirmed cat predation, predominantly by male cats, is responsible for the majority (67%) of woylie predation deaths at Dryandra.

Not surprisingly, the research has revealed the complicated nature of predator interactions. At George Forest Block, on the eastern margin of the northern jarrah forest, we have found cats are not the only species to show a mesopredator release response. The fox population is clearly at a lower density than at unbaited sites, yet it appears to provide sufficient competition with cats to prevent the cat population from increasing. We have hypothesised this level of fox density reduction has enabled the observed high density of chuditch and goannas; both appear to have shown a mesopredator release response. Ecological theory predicts as native predator diversity increases, food web stability is enhanced and intra-guild predator interactions increase. This in turn can reduce negative flow-on effects. In keeping with this, we have observed low fox density, low cat density and relatively high native predator (chuditch and goanna) density coincides with a higher diversity of native prey species. The woylie population at George Forest Block is of particular interest. It is possibly the only woylie population to have shown an increase over the past decade.

Threatened Species Research Forum

Western Australian Ecology Centre

9th July 2010

A Review of WA Government Research into Threatened Species