

Changes in anti-predator behaviour of prey after large predator declines

Large carnivores are suffering severe declines worldwide due to their vulnerability to habitat loss, emerging diseases and persecution. Their loss has been attributed to changes in the abundance and behaviour of other species, including small mammals and vegetation, and in some cases resulting in species extinctions.

On the island state of Tasmania, Australia, the largest mammalian carnivore is the Tasmanian devil. It has experienced significant declines due to an unprecedented contagious cancer, devil facial tumour disease (DFTD). The disease was first discovered in 1996 and has resulted in local population declines of more than 95% in regions where DFTD has been present the longest. The disease has now spread to more than 85% of their current geographic range, which is restricted to Tasmania. Despite new vaccination trials and successful captive breeding programs it is expected that wild devil populations will remain very low for decades.

Through parallel studies we have observed the impacts of the scale and spread of DFTD on other species. This includes evidence for the decline in small native mammals, increasing invasive species, including the feral domestic cat, and an increase in prevalence of Toxoplasmosis, a disease which is of particular concern to native Australian animals. Our research has also revealed changes in the behavior of a major prey species of devil, the common brushtail possum. Behavioral changes in prey are some of the most rapid responses to changing predator populations.

Prey must balance the need to forage for food with the risk of being eaten and therefore finely tune their behaviours to maximise the first and minimise the latter. A reduced threat of predation can lead species to reduce or in some cases lose particular antipredator behaviours that come at a cost. Individuals may change their behaviour to take greater advantage of resources, such as foraging further from an area of perceived safety to take advantage of better quality food. This can have flow on effects to reproductive success and an increase in population abundance over time. In the case of brushtail possums, a predominantly arboreal herbivore, they may spend greater time on the ground and forage further from trees which they can climb to escape terrestrial predators.

In our recent study published in the *Proceedings of the Royal Society B* we assessed behavioural changes in brushtail possums. Local devil populations suffer immediate and extensive declines following DFTD arrival. In response, possums are increasing their activity and changing their ground foraging behaviour. Possums are foraging further from areas of refuge, for longer periods where devil populations have been declining the longest. Within 20 years of the sustained decline in devils, possums have relaxed their behaviours to such an extent that they are now indistinguishable from possums on an island where devils have never been present. Antipredator behaviours possums use to avoid other predators, such as birds of prey can still be observed.

Behavioural changes are likely to be a signal of broad changes occurring within the ecosystem, with potential for flow on effects to a wide range of species. Ecosystems are comprised of complex interactions between different species and any disruptions can flow through multiple levels of an ecosystem. For example, changes in behaviour can lead to increase grazing pressure which can impact vegetation communities, thereby affecting invertebrate species and other herbivores.

Worldwide, large predators have been lost from large tracts of their historical ranges, and our recent studies, including this one focusing on prey behaviour, highlight the effects of losing these species, effects unlikely to be restricted to Tasmania. Long-term absence of large predators may change the dynamics of species and species interactions. Protection and even restoration of large predators may be the key to stemming the flow of biodiversity loss.

Publication

[Relaxation of risk-sensitive behaviour of prey following disease-induced decline of an apex predator, the Tasmanian devil.](#)

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