The Exotic Predator Problem

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INTRODUCTION

Fifteen years ago, when I joined the Department of Fisheries and Wildlife, fire ecology was the dominant research topic of the day. Medium-sized marsupials were either rare or extinct over much of mainland Western Australia, and those populations that were previously locally abundant had crashed. It was speculated that their demise was possibly due to drought and a variety of other causes — for example, inappropriate burning regimes, fragmentation of habitats beset by a variety of man-made disturbances, diseases, and climatic changes, to list a few. Clearly, it was a situation that held little scope for optimism.

My own views were strongly biased towards a nutritional explanation. Having worked with high-density populations of island macropods which experience seasonal nutritional stress, the idea of drought-induced mortality coupled with a reduced reproductive rate seemed to be an eminently reasonable explanation, at least for the recent declines. The puzzling aspect was: why no recovery following the end of the drought?

I abandoned this nutritional hypothesis after two years of research on Wheatbelt rock-wallabies (*Petrogale lateralis*), because, contrary to expectations, the supporting evidence for nutritional stress was negative even during a declared drought year. Accordingly, we were confronted with this question: given a fit, healthy population producing young, why the low numbers and why no population growth?

These questions were answered by my research on rock-wallabies living on remnant vegetation in the central Wheatbelt. In this area, we found that fox (*Vulpes vulpes*) predation was the primary factor controlling population numbers. By reducing fox populations through baiting, we were able to reverse the parlous situation of the rock-wallaby.

Baiting programs, now operational on several Wheatbelt reserves, have produced comparable reversals for other species. Tammars (*Macropus eugenii*), brush-tail possums (*Trichosurus vulpecula*), woylies (*Bettongia penicillata*), and numbats (*Myrmecobius fasciatus*) have increased appreciably and can be sighted on most occasions, with little effort, where baiting programs have been implemented. Elsewhere, chuditch (*Dasyurus geoffroii*) and ring-tail possums (*Pseudocheirus peregrinus*) have increased in response to baiting regimes. Bandicoots (*Isoodon obesulus*) have been successfully translocated to the Tutanning Nature Reserve, from where they had disappeared (Friend, pers. comm.). There are some indications that the populations of brush wallabies *(Macropus irma)* may also be significantly affected by foxes.

To summarise, medium-sized marsupial populations persisting on Wheatbelt nature reserves existed at low densities or, if locally abundant, crashed in the 1970s and did not recover spontaneously. Some populations declined to extinction. Recovery to conspicuously higher densities ensued under fox baiting programs.

ECOLOGICAL IMPLICATIONS

The message for management is this: in the absence of exotic predator management, medium-sized marsupials experience great difficulties in maintaining viable populations on Wheatbelt reserves (and, for that matter, on other more extensive Crown lands as well). This suggests that the fox is acting as an efficient biocontrol agent affecting a suite of marsupial species and likewise some ground-dwelling or ground-nesting birds (for example, malleefowl *Leipoa ocellata*).

In situations where medium-sized marsupials persist in the absence of predator control, population densities are invariably low. These sites should be viewed as predation refuges that promote survival but do not guarantee population viability.

Predator removal results not only in population increases but also in habitat shifts (that is, expansion of the realised niche) by affected species. Predator control enables affected species to move out from refuge areas and utilise habitat denied to them in the presence of predators. Destruction or disturbance of these predation refuges — for example, through bushland clearing or fire — greatly increases the risk of extinction in the absence of predator control.

In the past, lack of knowledge about the impact of exotic predators has led to distorted ecological perceptions regarding the habitat requirements of species affected by predators. Habitat requirements have been equated to predation refuges, which are characterised by protective cover with food nearby; these refuge sites are not necessarily typical of a species' habitat requirements (niche). Failure to realise this leads to interpretations which promote the view that habitat loss is the major factor causing the demise of many marsupial species. A corollary to this reasoning is the inference that medium-sized marsupials are intolerant to disturbance and thus can only persist in near-pristine environments. Clearly, these concepts should be re-examined in the light of current evidence.

IMPLICATIONS FOR MANAGEMENT

The objective of research into fox control was to test the hypothesis that fox predation is a limiting factor affecting population dynamics of native marsupials — hence the need to nullify as far as possible the impact of fox predation. This has led to baiting procedures for small nature reserves that may well be excessive for management purposes.

Nonetheless, it should be borne in mind that near total removal of foxes by intensive baiting provides a measure of the carrying capacity of a reserve for medium-sized marsupials. This step is mandatory if other limiting factors are to be identified.

Finding the optimum, cost-effective level for baiting will not be a quick or easy exercise. The baiting effort will need to be manipulated and the prey response monitored. Such research raises a difficult question: at what densities should recovered populations be managed? Fifty per cent of carrying capacity? More, or less?

Notwithstanding the above, and to complicate matters even further, there is some evidence that the predation pressure exerted by foxes is variable. Data from the rock-wallaby study (Kinnear unpublished) implies that fox predation is likely to be episodic. The message here is that short-term studies may well result in conflicting and confusing outcomes.

INTERACTIONS WITH OTHER LIMITING FACTORS

Inevitably, periods of drought can be expected to lower the carrying capacity of a reserve, leading to mortality among populations of medium-sized marsupials. Mortality could well be exacerbated due to invading foxes switching from collapsed populations of alternative prey, such as rabbits, on adjacent farmland. Likewise, bushfires, naturally occurring or otherwise, may well increase the predation risk to medium-sized marsupials.

In both of these situations, a higher level of baiting may be required, to avoid excessive losses of medium-sized marsupials. It is likely that a higher level of baiting will need to be maintained during the recovery phase, particularly if the prey numbers are low.

THE FUTURE

The demonstration that control of exotic predators results in recovery of some populations of medium-sized marsupials on Wheatbelt reserves studied should put paid to the prevalent view that habitat loss or degradation has been the single cause of their demise. That some of these species increase significantly in numbers when fox predation is eased shows that they are adaptable, resilient species capable of persisting (as do grey kangaroos) within fragmented, disturbed ecosystems where large areas of bushland remain. Indeed, some species may, locally, achieve minor pest status and thus create management problems.

These realisations provide a basis for greater optimism about the future of some medium-sized marsupials. One can take some heart from the numerous island populations of marsupials that have persisted for many thousands of years.

The ultimate solution to the fox problem is biocontrol. Such research is in progress, but it must be emphasised that this research is high risk and may not yield a solution in the near future. However, much will be learned about the fox as a predator during the course of this work. Unquestionably, some of this knowledge will greatly improve and enhance conventional control methodologies.

FURTHER READING

Friend, J.A., 1990. The numbat *Myrmecobius fasciatus* (Myrmecobidae): History of decline and potential for recovery. *Proceedings of the Ecological Society of Australia* **16**: 369–377.

Kinnear, J.E., Onus, M.L., and Bromilow, R.N., 1988. Fox control and rock wallaby population dynamics. *Australian Wildlife Research* **15**: 435–450.

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