

Introduction to the special edition on overabundant macropods

By John L. Read , George R. Wilson , Graeme Coulson  and James Q. Radford 

Kangaroos and their smaller relatives are collectively known as macropods. With their unique and efficient hopping gait, flexible reproductive strategy and miserly metabolism, they are beautifully adapted to the variable Australian environment and hold a special place in Australian culture and ecology. Some small macropod species have declined to extinction (Woinarski *et al.*, 2012), while others are endangered and are targets of intensive conservation research and management (e.g. de Tores *et al.* 2007; Kingsley *et al.* 2012; Pearson 2013; Whitehead *et al.* 2018). In contrast, the larger kangaroo species (*Macropus* spp. and *Ospbranter* spp.) and some wallabies (*Notamacropus* spp., *Wallabia bicolor* and *Thylogale billiardieri*) have benefited from land-use changes intended to support introduced livestock. Tree clearing, provision of permanent waters and removal of predators have enabled grass-eating species to proliferate in pastoral and agricultural lands. This dichotomy between conservation concerns about species in decline and those increasing in abundance was encapsulated by Frith and Calaby (1969) in their classic book *Kangaroos*:

"Given sensible legislation, the large kangaroos are, on the whole, fairly capable of looking after their own future for some time yet—some species are a bit too capable. The unfortunate aspect of often emotional and usually fruitless public discussions is that they tend to divert attention from what are the real problems in the conservation of Australian mammals. While public attention is focussed on the large kangaroos, the smaller marsupials and other mammals are rapidly disappearing from the face of the earth unnoticed."

Published 50 years ago, this statement still rings true today. The threats to smaller macropod species remain serious, although

the effect of predation by the introduced European Red Fox (*Vulpes vulpes*) and feral Cat (*Felis catus*) are now better understood (Radford *et al.* 2018) and better managed (Woinarski *et al.*, 2012). The effects of irruptions of large macropod on agricultural production and animal welfare identified by Frith and Calaby (1969) remain serious (Wilson & Edwards 2019), yet only relatively recently have their threats to biodiversity and other ecologically valuable assets received attention (Wagner & Seal 1992; Garrott *et al.* 1993), including rehabilitation sites (Neilly & Cale 2020; Freeman & Pobke 2021), protected areas (Ingram 2018; Morgan *et al.* 2018; Prowse *et al.* 2019) and recreational parks (Gordon *et al.* 2021). More recent research is also showing irruptions of some smaller macropods, including bettongs (Linley *et al.* 2017) and wallabies (Dexter *et al.* 2013), can also cause significant environmental damage.

The definition of overabundance varies widely, and the macropod density at which impacts are deemed intolerable depends on the land manager. Golfers accept much higher densities (Inwood *et al.* 2008) than graziers, who in turn tolerate more kangaroos than farmers with emergent crops (Hill *et al.* 1988), horticulturalists or winemakers. Macropods can also be deemed overabundant when they affect the regeneration of forestry and mining estates (Koch *et al.* 2004; Di Stefano 2005; Hazeldine & Kirkpatrick 2015), and when they pose safety risks on roads (Abu-Zidan *et al.* 2002; Ang *et al.* 2019).

Although challenges posed to both conservation programmes and agricultural enterprises by overabundant macropods are now more evident, the way forward is not clear. Some groups insist that populations of the large kangaroos are endangered. Again, Frith and Calaby (1969) highlighted this same polarity of views over 50 years ago:

"Those who are concerned with the maintenance of the present numbers of kangaroos or abhor the shooting of them point to local and widespread decline in kangaroo numbers from time to time as evidence that the animals are being eradicated from Australia, a cry that is readily taken up abroad and repeated with increasing conviction. On the other hand, some landholders' organisations have coined a useful phrase 'plague proportions' to cover most kangaroo populations and refer to greater local numbers than existed locally last year, last decade or, in some cases, last century, to justify further reduction in numbers."

The public receives conflicting information. Animal rights campaigners, who overlook or distort refereed research articles, now use social media and endorsements by celebrities to influence consumers and campaigners worldwide. Their idealistic messages

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equate factory farming of livestock with 'cruel' and unsustainable wild harvesting of macropods, and infer that as a result all kangaroo species are endangered (Viva 2007). The intensity of these campaigns has increased, but their impact is not new. In 1973, under the influence of animal rights campaigners, the Minister for Customs banned the export of kangaroo products from Australia. From 1973 to 1975, a working group of macropod managers convened by the Council of Nature Conservation Ministers compiled a 'Status of kangaroos and wallabies in Australia' that concluded red and eastern grey kangaroos, which had been the focus of public conservation concern, were adequately safeguarded within reserves and were in similar or higher numbers than historically outside reserves (Burbidge, 1977). The export ban was lifted in 1975, after Commonwealth and Australian States agreed to a more coordinated approach to kangaroo management. Yet, the polarity continues to this day, with renewed yet unsubstantiated campaigns to prohibit imports to the United States and some bans continuing to apply in states such as California (California Penal Code 2016).

From an opposing perspective, ecologists, conservationists and informed animal welfare advocates have joined with landholders in recognising the production, biodiversity and welfare implications of degradation caused by overabundant macropods (Cooney *et al.* 2012). News broadcasts show graphic footage, supported by robust monitoring data, of hundreds, even thousands, of kangaroos moving across degraded country, often starving to death (SMH 2015; BBC 2017). Even the voice of Indigenous Australians is divided between those eager to continue using macropods as a customary and highly valued source of food, and those who claim that consumption of kangaroos is culturally inappropriate (Thomsen *et al.* 2006). It is little wonder the public and policymakers are confused, or at best ambivalent, about the urgency for better management or unconditional protection of our macropods.

Fifty years after Frith and Calaby, two factors have converged to impair the effective management of large macropods. Firstly, the demand for export and local consumption of kangaroo meat and skins has fallen (Boronyak *et al.* 2013). Influenced by a concerted publicity campaign focused on claims of conservation and welfare threats of the kangaroo industry, the number of kangaroo harvesters and the proportion of kangaroo quotas used have declined (Wilson & Edwards 2019). This downturn in the kangaroo industry, in concert with favourable rains in 2010–12, resulted in a dramatic increase in kangaroo populations across much of the Australian rangelands and agricultural regions (Wilson & Edwards 2019). Ironically, a cessation of harvesting female kangaroos in some areas, in order to address welfare concerns about the fate of joeys, has biased the sex ratio in favour of females and led to even faster rates of population increase (Hacker *et al.* 2004; McLeod *et al.* 2004; McLeod & Sharp 2020).

Then, a serious drought in western NSW, western Queensland and northern South Australia led to the starvation of millions of kangaroos on pastoral, farming and conservation estates (Wilson & Edwards 2019). However, unlike the massive fish kills in the Darling River caused by the same drought, this widespread

starvation of kangaroos was largely overlooked by national media and politicians. Those policymakers who were alerted and alarmed by the suffering and deaths of millions of kangaroos did not have a ready response. The immediate fallback management tool for overabundant kangaroos has been non-accredited and non-commercial destruction, with carcasses rotting where they are shot. Although, in some instances, kangaroos can be managed using non-lethal methods (Ben-Ami & Mjadwesch 2017), lethal management is unavoidable in most cases. Most stakeholders accept this reality and recognise that using the commercial industry is the most socially accepted and appropriate method of kangaroo management to avoid waste (Hampton *et al.* 2018; Gordon 2019; Hampton & Teh-White 2019; McLeod & Hacker 2019). Pragmatic endorsement of commercial harvesting of abundant kangaroos to benefit landholders, conservation, animal welfare and carbon sequestration (Wilson & Edwards 2019) has been proposed many times by wildlife scientists (Grigg 1988; Archer 2002; Read 2003) but has not yet led to clearer management goals or improved outcomes.

Frith and Calaby (1969) felt that 'one of the first essentials for the ultimate solution of the kangaroo controversy is objective research on the biology of the animals and their effects on pastures and interaction with domestic stock'. Extensive research and monitoring now means that the biology of large kangaroo species is better known than perhaps any other species of Australian wildlife. These findings are compiled into state-based plans of management, such as that for Western Australia (WA DBCA 2019) and South Australia (NRSAL & SA DEWNR 2017). However, these plans do not address Frith and Calaby's essential concern, the interaction with domestic stock and pastures, which was recognised as a knowledge gap in the Rangeland Journal Special Edition on Managing Total Grazing Pressure in Australia's Southern Rangelands 2020 (Atkinson *et al.* 2019). Furthermore, these plans do not yet fully recognise the impacts of booming kangaroo numbers on the integrity of vegetation in protected areas, which inspired Prowse *et al.* (2019) to recommend 'an adaptive, coordinated and cross-tenure approach to maintaining total grazing pressure below thresholds, including consideration of top-down control measures'.

In 2019, both the Australian Rangeland Society Biennial Conference (Canberra, September 2019) and the Ecological Society of Australia Conference (Launceston, November 2019) hosted symposia to directly explore the issues associated with overabundant macropods, to present data on management approaches and to brainstorm a coordinated informed strategy to minimise the environmental, welfare and wastage issues of overabundant macropods. Realising the importance of political and social licence to progress optimised management, these symposia diversified from solely presenting objective research to also facilitating guided group discussions about the consequences and solutions of overabundant kangaroos to animal welfare, environmental protection and conservation, natural resource management, food waste and human health and welfare.

Consideration of political and social nuances in the management of ecological issues is often shunned by scientific journals,

although the detailed consideration of the evolution of the debate (1948–2009) on the commercial harvesting of kangaroos in NSW by Lunney (2010) is an exception. However, renewed consideration and publication of the topic fits well with the objectives of Ecological Management & Restoration to ‘answer the growing need among land managers for reliable, relevant information and acknowledges the need for two-way communication in devising new hypotheses, sound experimentation, effective treatments and reliable monitoring’. Furthermore, the guest editors and board of *Ecological Management & Restoration* have deliberately shaped this special edition to inform and stimulate social and political debate on optimum management of those macropods with a propensity for overpopulation.

This special review publishes several of the key studies presented at both symposia along with invited papers, opinions and letters from key stakeholders. Some presenters gave graphic personal accounts of the emotional and financial trauma of dealing with dead and dying kangaroos, which are captured by the contributions of Zanker; McMurtrie and Kerle; Pedler *et al.* and Finlayson *et al.* Contributors reviewed the effects of overabundant macropod populations in contained populations (Coates; Treloar *et al.*), as well as impacts on soil/erosion (Eldridge *et al.*), native plant communities (Morgan; Freeman & Pobke; Read *et al.*), grazing management programmes (Gordon *et al.*; Snape *et al.*) and urban ecosystems (Herbert *et al.* 2021). Our ability to adaptively manage macropod populations is enhanced by new research on optimal macropod survey tools and analyses (Finch *et al.*; McLeod *et al.*; Coulson *et al.*); patterns in kangaroo–vehicle collisions (Dunne & Doran); breeding seasonality to minimise welfare concerns for joeys (Lucas *et al.*); early warning signs of population irruptions (Wilson & Coulson); fertility control for overabundant peri-urban macropods (Wimpenny *et al.*); and prospects for managing confined kangaroo populations with one-way gates (Pedler *et al.*). Stephens evaluates the welfare outcomes of kangaroo management methods. Finally, the rationale and potential economic, environmental and welfare drivers for incorporating kangaroo harvesting into other pastoral or rangeland livestock enterprises (Wilson & Edwards) and Aboriginal enterprises (Hunt) are reviewed.

Despite the attempts of the editorial team for this special edition to be as comprehensive as possible, we acknowledge that several important issues have not been dealt with systematically. Cases in point that still require detailed assessment include the impact of the ever-expanding series of ‘cluster fences’ on kangaroos and other biodiversity; the effects of macropod grazing pressure on sustainable agriculture production and other biodiversity; and optimum management of wallabies in Tasmania where in excess of 550,000 are hunted recreationally, harvested commercially, culled or poisoned for the protection of primary industries and conservation assets annually (Game Services Tasmania 2020; Tas DPIPW 2020; Wild Game Resources Australia 2021).

The concluding paper (Read *et al.* 2021) contains a position statement that synthesises the views of symposium attendees and other scientists and stakeholders on the current situation and recommendations for further work. The statement calls for clearer goals and strategies for improved and informed

management of overabundant kangaroos and wallabies, mirroring similar calls to action that have been expressed before and since Frith and Calaby’s now historic book. All stakeholders and policy-makers are urged to unite behind a cohesive call to action for managing the ‘wicked’ problem, yet significant opportunity, presented by overabundant macropods.

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