Kangaroos in Australian Rangelands

A.C. Grice and R.F. Beck

Are kangaroos a resource to be utilized, a pest to be controlled, a wildlife species to be conserved or a combination of these? The kangaroo family has some 40 species, most are small, rare, or restricted in their distributions and have little effect on rangeland management or agriculture. Many environmental groups and urban dwellers in Australia as well as environmental groups from other countries consider all of the kangaroos to be threatened and in need of protection from exploitation. As a result of this concern, some countries restrict the import of kangaroo products. The controversy among interested groups arises over the 4 largest species which are generally widespread and sufficiently common to have a significant impact on their habitat. These 4 species which have agricultural and pastoral significance are the red kangaroo (*Macropus rufus*), the eastern grey kangaroo (*M. giganteus*), the western grey kangaroo (*M. fuliginsus*), and the euro (*M. robustus*). Typical adult males weigh 50-60 kg and adult females weigh 24-30 kg (Table 1). An understanding of the ecology and role of kangaroos on rangelands is necessary for sound range management. The term kangaroo for the remainder of this article refers only to these 4 species.

Fig 1 *Red kangaroos in Stuart National Park, NSW, on a cobble site, annual rainfall is near 13 cm.*

Distribution and Habitat

The red kangaroo's habitat covers much of the arid and semi-arid land of Australia. It prefers more open country (Figure 1), such as the chenopod shrublands and Mitchell grasslands, it also inhabits woodlands. The two species of grey kangaroo are also widespread, preferring shrubland, woodland and forest habitats (Figure 2). The eastern grey kangaroo is found only in the eastern states while the western grey kangaroo is found across much of southern Australia. The euro is the most widespread, inhabiting the arid and semi-arid inland, and extending to the east and west coasts, often being associated with rocky or hilly habitats.

Forage and Water Needs

Kangaroos eat a wide range of forage plants. In general, they selectively graze green forage, take little browse and prefer grasses (Dawson 1989; Table 2). There are common plants in the diets of kangaroos and domestic stock, but the proportions of the various dietary components do differ between livestock and kangaroos. Sheep and kangaroos differ in their responses to deteriorating pasture conditions. Sheep tend to shift to a diet containing more browse and chenopods earlier in a dry period than do kangaroos (Edwards 1989). This earlier shift by sheep to other forage plants may reflect the influence kangaroos have upon the pasture by their greater ability to find and harvest the preferred green forage. It may simply indicate different dietary preferences per se.

Kangaroos require less water per unit weight than typical eutherian mammals because of their lower metabolic rates. The average kangaroo consumes about half the water consumed by a sheep (Dawson et al. 1975). The need for drinking water depends upon the moisture content of the diet, temperature and the availability of shade (Figure 3). The effects of kangaroos upon the availability of water for livestock are significant in drier regions. The consumption of water by kangaroos is likely to be of greatest significance to a pastoral enterprise when water is being pumped or carted during dry periods.

Mobility

Their mobility is an important aspect of the kangaroos' adaptation to their environment and also has a bearing on their pastoral impact. Home ranges expand at times of low

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Table 1. Weight, densities in favorable habitat, size of home range and size of mob for the 4 largest kangaroo species in Australia.

Kangaroo species	Average Weight male	female	Home range	Average density	Mob size
	(kg)	(kg)	(km^2)	(#/km^2)	(#)
Red	66	27	8	4-10	2-5
Eastern Grey	66	32	<5	3-5	5-9
Western Grey	54	28	7	3-5	2-5
Euro	47	25	.25	3	2-4

rainfall or deteriorating pasture conditions. Most individual kangaroos tend to remain within relatively restricted home ranges (Priddel 1987, Table 1), with males having larger home ranges than females. Kangaroos freely cross paddock and property boundaries and may travel 25-30 km to areas that have experienced isolated storms. Some later return to their former home ranges. However, kangaroos do occasionally travel long distances, some individuals being sighted more than 200 kilometers from their original point of capture.

Population Dynamics

In many areas, kangaroo numbers have increased since pastoral settlement, because of the increased availability of reliable water supplies, and the greater availability of green feed as livestock have grazed and trampled coarse grasses. Elimination of dingos (an important predator) in some areas may also have been important in allowing population expansion.

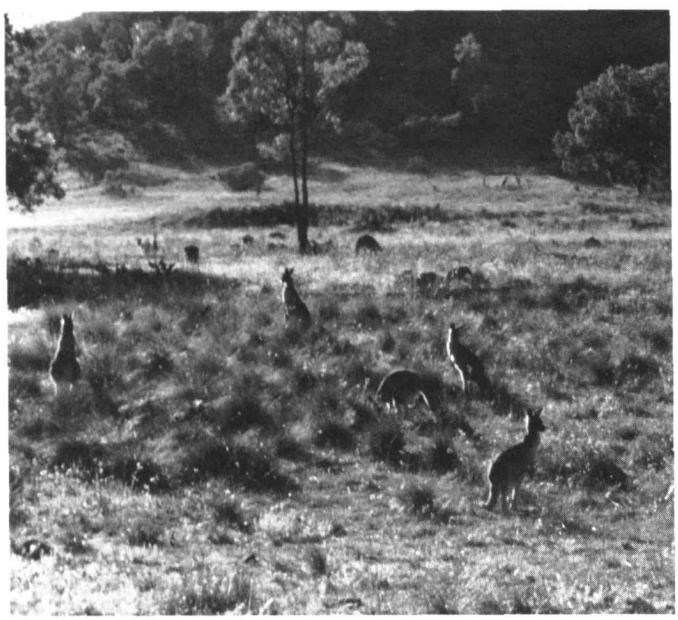

Fig 2. *Grey kangaroos feeding in early morning in Warrunbungles National Park, NSW.*

Kangaroo numbers fluctuate widely in response to seasonal conditions. Populations increase in times of average or above average rainfall and high pasture biomass but may be static during dry periods. During severe droughts, populations often decline dramatically. The total national population was estimated at 19 million in 1981 (Caughley et al. 1983), but decreased to 13.3 million due to widespread drought in 1984 (Grigg et al. 1985). Populations since then have generally increased because of better environmental conditions. Many of the kangaroos that die during drought are either pouch-young or old, but sub-adults may also suffer high mortality. During drought, animals are more common in or near open country and areas of heavy soil where green forage is more likely to be found. They shelter in the surrounding woodlands during the day but move into the open country at night to feed. In more favorable seasons, they may move to areas of lighter soil whose pastures respond more quickly to rain. Areas that have a mosaic of different land types are ideal habitat for kangaroos because they provide a range of resources under different seasonal conditions (Priddel 1987). Because of different resource availability the density of kangaroos varies greatly (Table 1). Average densities in western New South Wales were 4.2 reds and 3.2 greys/km^2 in 1975 (Caughley et al.

Table 2. Preferred habitat and dietary foods of 4 large kangaroo species in Australia

Kangaroo species	Preferred habitat	Preferred Plants
Red (*Macropus rufus*)	Open shrubland, grassland	Grasses: 75% (*Eragrostis, Aristida, Enneapogon, Themeda*) Forbs: 25% Shrubs: drought (chenopods)
Eastern Grey (*Macropus giganteus*)	Open woodland-forest	Grasses > 75%, short soft grasses (*Poa, Eragrostis*) drought: coarse grasses (*Triodia, Themeda, Aristida*) Forbs: very little
Western Grey (*Macropus fuliginosus*)	Open woodland-forest	Coastal Plain: sedges and grasses - 90% Dry inland: grasses - important some forbs woody plants important in drought
Euro (*Macropus robustus*)	Rock hills and outcrops: woodlands and chenopod shrublands	Dry season: grass - 90% (*Triodia*), Wet season: grass > 80% (*Aristida, Cenchrus*) Forbs < 20%

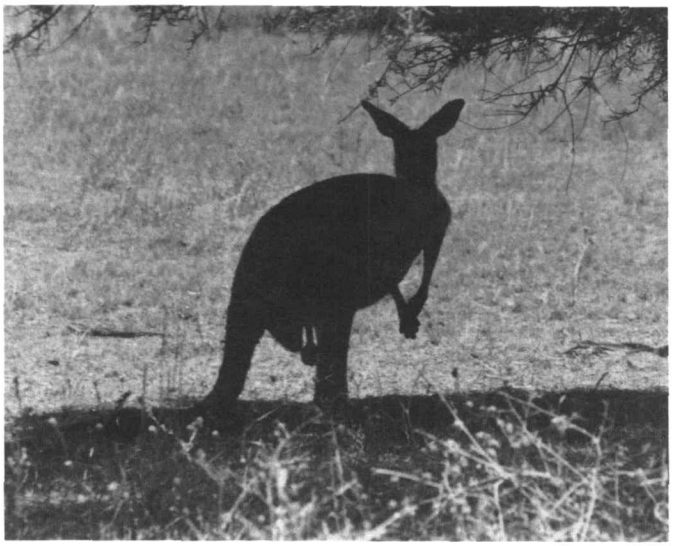

Fig. 3 *Grey kangaroo resting in shade of white pine in a grazed paddock in late summer. They often dig shallow forms in the shade to lay in during the heat of day.*

1977). Densities in Western Australia were much lower where conditions were drier and water more scarce than those found in the eastern states (Short et al. 1983). Bayliss (1987) reported densities of 15 kangaroos/km^2 in Kinchega National Park in New South Wales in 1973, while on an adjoining sheep property, there were 3 kangaroos/km^2.

Interactions Between Kangaroos and Livestock

At times, kangaroos and livestock compete for food and water resources. Competition is most likely during droughts when pasture biomasses are below 300-500 kg/ha (Short 1985). Marsupials have metabolic rates about 30% lower than those of eutherians and the maintenance energy requirement of kangaroos is 70-80% that of sheep (Denny 1982). The relationship between forage availability and food intake is similar for sheep and red kangaroos (Short 1985). Both species are capable of reducing pastures to less than 20 kg/ha. In terms of the amounts of forage consumed, one sheep is equivalent to between 1.4 and 1.6 kangaroos (Wilson and Harrington 1984).

Sheep and kangaroos generally disassociate from one another. Kangaroos will move to sheep-free exclosures or to parts of paddocks that sheep do not frequent. It is common to observe more kangaroos in areas such as national parks than areas grazed by livestock (Bayliss 1987). This might be due to the culling of kangaroos outside national parks or to the removal of livestock from the parks.

Kangaroo Effect on Pastoral Industries

By preferring grasses, kangaroos have major effects on a component of the pastures that is pivotal in the overall dynamics of the vegetation and the other ecosystem components. Grasses are important not only as sources of forage for livestock but also for their role in reducing soil erosion and for improving water infiltration. Moreover, in rangeland situations, grasses are crucial because they reduce the chances of establishment of unpalatable shrubs. They are also the main source of fuel for fire that is an important means of controlling established shrubs. Grasses provide a habitat for invertebrates, reptiles and small mammals. Thus, by selectively grazing grasses, kangaroos have the potential to influence animal production, land condition and conservation values.

Control and Management

Kangaroos, like all Australian wildlife are the property of the state in which they are found. Conservation and management of kangaroos is controlled primarily by State legislation. However, import and export of wildlife or wildlife products comes under Federal jurisdiction.

Each state must prepare a management program for its kangaroo population if it wishes to export kangaroo products and the program must conform to the Australian National Parks and Wildlife Service Management plan for kangaroos. Before any culling is allowed, state programs must assess kangaroo populations and population trends, set quotas for the maximum numbers of kangaroos of each species that may be culled and used commercially, and impose regulations governing the culling of kangaroos. Annual quotas for each species are based principally on population size and trend. Other factors taken into account include seasonal conditions, size of previous harvests, habitat factors, and social concerns.

In the late 1970's and in the 1980's quotas for New South Wales were between 7-15% of the corresponding estimate of the total population (NSW National Parks and Wildlife Service 1988) and in Western Australia quotas varied from 15-25% of the estimated population between 1971 and 1990 (McLaughlin 1992). Actual harvests usually fall well below the quotas that are set, for example, in New South Wales between 1975 and 1987, the actual commercial cull averaged 68% of the commercial quota and in Western Australia it was 70-80% during the same period. Commercial harvesting may reduce the rate of growth of a low kangaroo population, but it is unlikely to have a major effect when populations are large or increasing rapidly. Markets are unlikely to be able to respond in an appropriate time frame, or to an adequate degree, to environmentally induced fluctuations in kangaroo populations.

There may be times when it is critical from a pasture management point of view to reduce total grazing pressure. A pastoralist may obtain a permit for non-commercial culling, but managerial and social factors limit the effort that a pastoralist can personally put into culling kangaroos. Generally, non-commercial culling targets particular situations at the local level.Grigg (1987) proposed that by increasing the prices of kangaroo products and developing an industry based on the sustainable harvesting of kangaroos, pastoralists could have a source of income that would give them flexibility to alter sheep numbers.

Other alternatives the pastoralists have are to restrict kangaroos' access to particular areas. It is possible to build

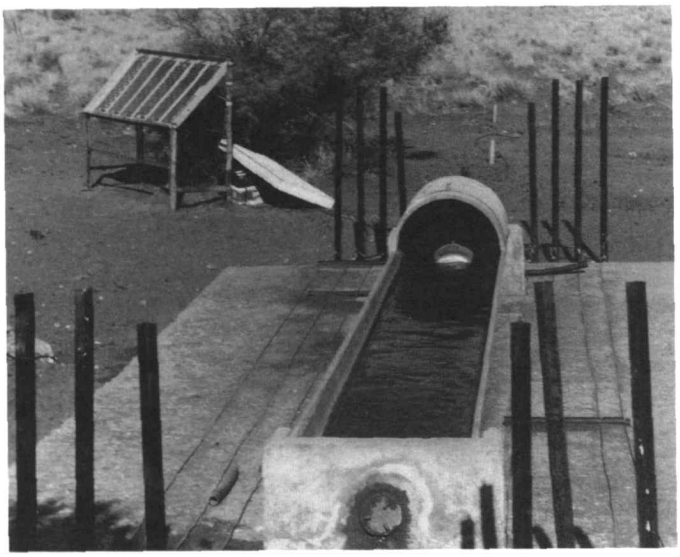

Fig. 4 *Electrified wires beside water trough will keep kangaroos from drinking (98% effective) because their large feet and tail will touch the wires, while sheep can step between the wires when getting a drink.*

kangaroo proof-fences. Conventional (non-electric) fences can be made impermeable to kangaroos, but the cost is prohibitive for individual landholders. Another idea currently being developed that reduces kangaroo use of pasture is using electrified wires around water troughs that exclude kangaroos from drinking but allow access by sheep (Figure 4).

Conclusion

The large kangaroos are significant herbivores in Australian rangelands and in many areas are more common than they were prior to European settlement. Because of their abundance, diets and mobility they often compete with livestock for the limited forage available. In seasons and areas where they occur at high densities, they do interfere with pasture management and land rehabilitation. Control of kangaroo populations, either by commercial or non-commercial culling or appropriate fencing of paddocks and watering points, should be timed and located to target specific range management needs. Critical times for such actions must be identified. There is need to explore and further develop alternative kangaroo management practices and to link them with management of the soil-plant resources.

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