How Many Kangaroos?

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Between 1980 and 1982 much of Australia was surveyed from the air to estimate density and distribution of kangaroos. The area surveyed covered 5.8 million km² (75% of Australia) and included most of the distribution of the three commercial species. Numbers were estimated as 8.3 million red kangaroos Macropus rufus, *1.8 million 'western' grey kangaroos* M. fuliginosus *and 5.0 million eastern grey kangaroos* M. giganteus. *The unsurveyed eastern highlands probably hold a further 4 million eastern greys, allowing a tentative overall estimate for 1981 of 19 million kangaroos in mainland Australia.*

Over the last few months the popular media have presented several disparate estimate of the number of kangaroos in Australia. None of these have revealed the source of the data and none have stipulated the species included within the category 'kangaroos'.

In common usage 'kangaroo' has two meanings – one broad, the other restricted. Broadly, a kangaroo is a member of any species within the genus *Macropus* (*sensu* Kirsch and Calaby, 1977) whose mature males exceed 40kg. Included are *Macropus rufus, M. giganteus, M. fuliginosus, M. robustus, M antilopinus* and *M. bernardus*. Narrowly, a kangaroo is a member of just the first three of those species, the others being called wallaroos or euros. (As an added complication, *M. antilopinus* is sometimes called a kangaroo and sometimes a wallaroo.) 'Kangaroo' and 'wallaroo' are vernacular terms. They have no more taxonomic validity than does 'wallaby', which connotes smaller macropod marsupials.

In what follows we adopt the narrow meaning of kangaroo as restricted to the red kangaroo *M. rufus* of arid and semi-arid Australia, the eastern grey kangaroo *M. giganteus* of eastern Australia including Tasmania, and *M. fuliginosus* (*sensu* Kirsch and Poole, 1972) of southern Australia. This is usually referred to as the 'western' grey Kangaroo but, since about 70% of the members of the species live to the east of a line linking Darwin with the apex of the Australian Bight, this name is unsupportable. We refer to the species here as the southern grey kangaroo and recommend the general adoption of this name. Figure 1 shows the distribution of this species and that

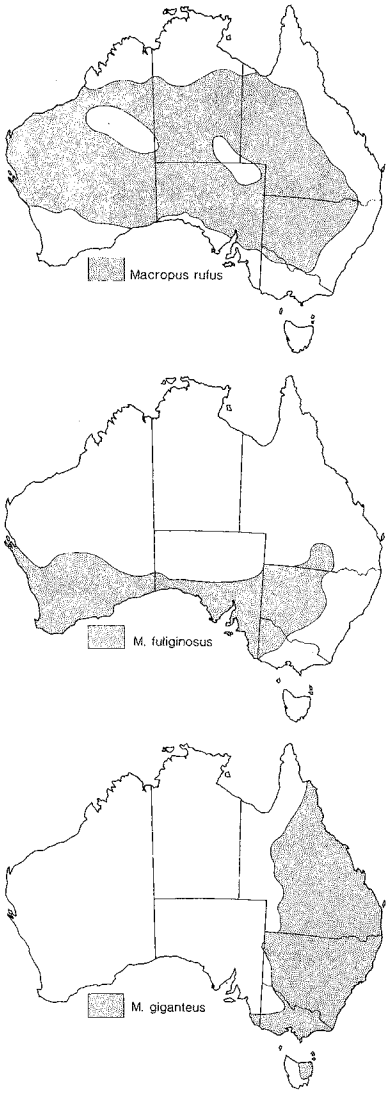

FIGURE 1
Distribution of three species of kangaroos

of the other two kangaroos as determined by aerial and ground surveys between 1977 and 1982.

Much of Australia has been surveyed from the air to estimate density and distribution of kangaroos. Those surveys conducted within the last few years, the results of which are published or in press, cover the pastoral zones of Queensland (Hill, 1981; Caughley and Grigg, 1982), New South Wales (J. Caughley and Bayliss, undated), Victoria (Short and Grigg, 1982), South Australia (Caughley and Grigg, 1981) and Western Australia (Short *et al.*, in press). These surveys covered 2.9 million km². Between 1981 and 1983 we surveyed an additional 2.9 million km² of more remote country to fill in the gaps between the pastoral zone surveys. Included were the complex of central deserts and much of the Northern Territory. The published surveys referred to above, together with our unpublished surveys,

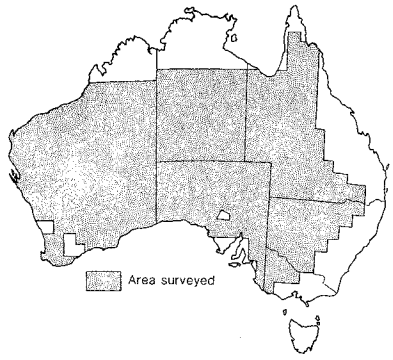

FIGURE 2
Area in which kangaroos were surveyed from the air

cover the total range of the red kangaroo, all that of the southern grey kangaroo save for a few small lacunae, and the mainland range of the eastern grey kangaroo west of the eastern highlands. Figure 2 shows the area covered by both the published and unpublished surveys.

The surveys used here to provide an approximation to total numbers are restricted to those flown between 1980 and 1982. The figures we use for the pastoral zone of South Australia are from a survey in 1980 (Grigg *et al.*, 1980). The New South Wales figures are from surveys between 1980 and 1982, most supplied by J. Caughley (pers. comm.) from surveys by the NSW National Parks and Wildlife Service and augmented by data from surveys by us in winter 1982. All surveys to which we have referred, both published and unpublished, used a similar survey design and identical correction factors for visibility bias (Caughley *et al.*, 1976).

The two species of grey kangaroo can be differentiated from the air only in very favourable circumstances. In practice it is seldom attempted. Within their zone of overlap, which spans parts of Queensland, New South Wales, Victoria and South Australia, these two species are lumped by an aerial-survey observer into the single category of 'grey kangaroos'. From the ground they can be differentiated easily. The ratio of the two species has been estimated in each of the 88 degree blocks within and around their zone of overlap (Caughly *et al.*, in press), thereby allowing a dissection of the aerial survey estimates of conjunct density into their two specific components.

Table 1 reports estimated numbers of kangaroos on the mainland of Australia subdivided by state and by species. We present these as a rough indication of numbers in 1981, the middle year of the three years over which the data were gathered. Numbers are estimated as 8.3 million red kangaroos, 1.8 million

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State	Numbers			
	M. rufus	*M. fuliginosus*	*M. giganteus*	**Total**
Qld	2,102,000	100,000	3,002,00*	5,204,000*
NSW	3,837,000	879,000	1,971,000*	6,687,000*
Vic	2,000	21,000	5,000*	28,000*
SA	1,281,000	338,000	< 1,000	1,619,000
WA	1,027,000	436,000	NP	1,463,000
NT	102,000	NP	NP	102,000
Australian mainland	8,351,000	1,774,000	4,978,000* +*c*.4,000,000	15,103,000* +*c*.4,000,000

*indicates count is incomplete because part of the species' range was not covered.
NP indicates 'not present'.

TABLE 1 Estimated numbers of kangaroos on the Australian mainland in 1981

southern grey kangaroos, and an incomplete count of 5.0 million eastern grey kangaroos. Total numbers sum to 15.1 million kangaroos in the area surveyed. The mainland range of the eastern grey kangaroo includes a further 0.8 million km^2 of eastern highlands which have not been surveyed from the air. From field experience we would rate as unlikely an average density for this area exceeding 10km^{-2} or falling below 1km^{-2}. We advance 5km^{-2} as a necessarily tentative but plausible guess. A further 4 million animals can therefore be added with caution to the tally of the eastern grey kangaroo, raising its total to 9 million and that of the three species combined to 19 million.

These estimates are already out of date, but they nevertheless provide a useful benchmark. They probably exceed the long-term average because they were estimated towards the end of seven years of plenty in eastern Australia. J. Caughley and Bayliss (undated) showed that kangaroo numbers rose rapidly on the inland plains of New South Wales between 1975-76 and 1980. Against that, total numbers were influenced by a drought in Western Australia which lasted for between two and four years according to area, and which broke the year before kangaroos were surveyed within the pastoral zone of that state in winter 1981. Numbers in Western Australia were probably well below their long-term average at that time.

Since 1981 Western Australia has received good rains. Numbers there will be higher now than in 1981. Over the same period eastern Australia entered a drought which intensified over the 1982-83 summer. We suspect that the very dry conditions of that summer, which reduced vegetative biomass dramatically on the eastern inland plains, will have reduced the numbers of all three species. Hence we have little doubt that total numbers now are lower than those presented for 1981. That prediction will be tested by surveys covering parts of Queensland, New South Wales and South Australia during the winter of 1983.

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