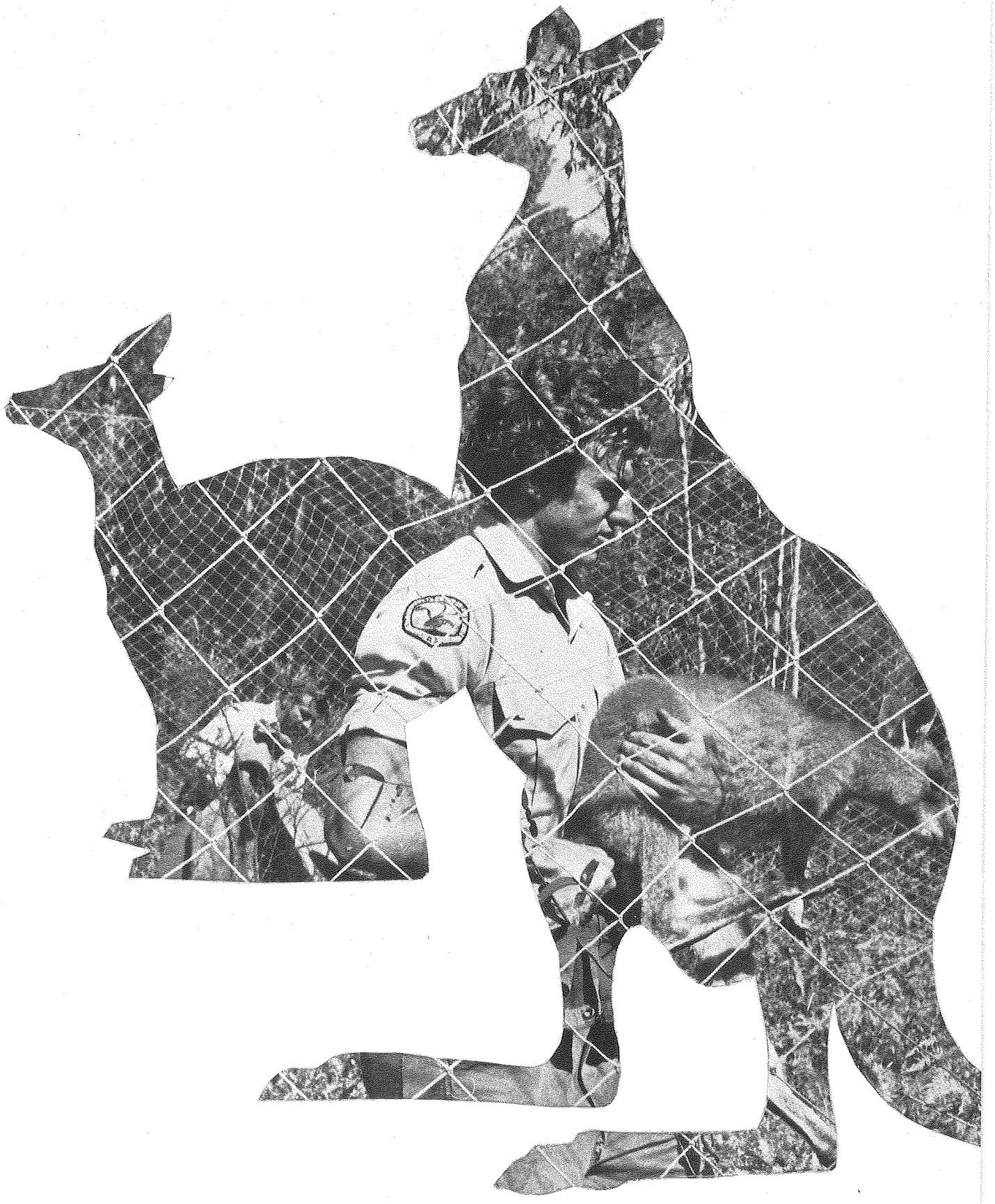

# Management of Kangaroos

# THE MANAGEMENT OF KANGAROOS

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## INTRODUCTION

Where kangaroos occur on agricultural properties they are no longer truly wild animals because they are living in a modified ecosystem which man is manipulating to achieve his objectives of commercial production. Therefore, the status of these kangaroos is different to that of those on a national park where the ecosystem is manipulated so that it resembles, to the best of our ability, its condition before the advent of technological man. On commercial properties kangaroos are at best part of a multiple land use concept, or, more commonly, are regarded as agricultural pests, while on national parks they are an essential integral part. The two systems should not be confused because they have totally different objectives. The only satisfactory solution to the problem of kangaroos on private land is to include them as part of the ecosystem of agricultural production.

It is also necessary to make a distinction between the kangaroos and the smaller macropods such as pademelons and wallabies most of which are far less common. The philosophy of commercial utilisation to ensure conservation through multiple land use does not apply to these species with their restricted distributions and lower populations. Consequently kangaroos in this article refers to the large members of the macropod family.

## HISTORY OF KANGAROO UTILISATION IN NEW SOUTH WALES

Initially only kangaroo skins were used commercially but by 1960 the utilisation of kangaroo meat had been recognised as a valuable alternative to the rabbit industry which was waning because of myxomatosis. After several years of intensive shooting, kangaroo populations fell, particularly those of the red kangaroo, **Megaleia rufa,** a phenomnon which was recorded along fixed transects in the Riverina of New South Wales. As a result commercial shooting became uneconomic and operators closed down in some areas. Nevertheless during 1964-67, drought increased the kangaroos' impact on pastures and crops, so farmers, graziers and shooters continued to take large numbers until 1968, with a peak take occurring in 1965. The variations in the annual take shown below reflect the presence or absence of drought, as it is during drought that there is the greatest demand by graziers to shoot kangaroos.

| | | | |
|---|---|---|---|
| 1960 | 76,000 | 1967 | 170,000 |
| 1961 | 86,000 | 1968 | 72,000 |
| 1962 | 90,000 | 1969 | 45,000 |
| 1963 | 120,000 | 1970 | 78,000 |
| 1964 | 177,000 | 1971 | 80,000 |
| 1965 | 270,000 | 1972 | 137,000 |
| 1966 | 252,000 | 1973 | 122,371 |

Table 1. Numbers of kangaroos shot legally in N.S.W. 1960-1973.

These figures are calculated from N.S.W. export figures, skin dealers' returns, chiller returns, trappers' returns and figures given by graziers. Therefore they can only be accepted as generalised figures although they increase in validity from 1960 up to 1973.

## POPULATIONS HAVE INCREASED

Despite the large numbers of kangaroos taken in the last 10 years, it is doubtful whether kangaroo numbers have fallen to below the levels encountered by the early outback explorers. None of these explorers reported seeing mobs of several hundred kangaroos such as can be seen in western New South Wales today. It is unlikely that Burke and Wills would have perished if kangaroo populations were as high as they are today. Graziers have improved watering facilities, cleared the timber and encouraged the growth of grasses, thus improving the habitat for the large kangaroos which prefer a disclimax grassland community. These changes, while favouring the large kangaroos, have been to the detriment of smaller native fauna by removing their shelter. The removal of the dingo by aerial baiting and

steel traps has also contributed to the increase in populations of kangaroos, and of wallaroos, *Macropus robustus,* and the red-necked wallaby, *Macropus rufogriseus,* and other wallabies. The larger kangaroo populations now require management to keep their numbers in check. It is unrealistic to suggest, as some preservationists do, that kangaroo populations will somehow reach a plateau.

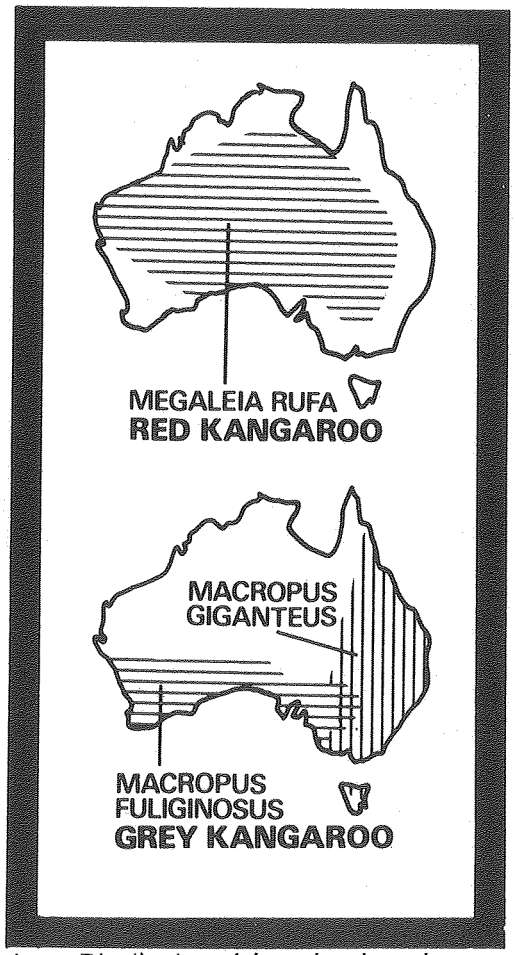



Fig 1. Distribution of the red and grey kangaroo. After Frith and Calaby 1969.

## KANGAROO MANAGEMENT OBJECTIVES

Kangaroos in N.S.W. are distributed abundantly throughout grazing lands and are common in agricultural areas as well as in national parks. Because their presence frequently conflicts with agricultural objectives they require management.

Such management may be according to the four objectives which are discussed below in order of increasing sophistication and economic utilisation.

1. Pest control
2. Professional pest control
3. Extensive husbandry
4. Intensive husbandry

### 1. Pest Control

**The reason for population control.** Deciding whether an animal is a pest is a subjective decision made by the land manager and depends on his tolerance. Some will accept large kangaroo populations for aesthetic reasons and because they believe that economic damage is not significant while others will tolerate few kangaroos.

Nevertheless there are circumstances in which kangaroo numbers tax the patience of the most tolerant grazier. For instance, grey kangaroos invade and eat agricultural crops and improved pastures, especially when seasonal conditions deteriorate and they emerge from the forests and wooded hillsides. In the arid regions, red kangaroos congregate on the scarce areas of green feed which result from passing storms and they are attracted to spelled paddocks which interferes with attempts by graziers to conserve pasture for times of need. During drought they compete with sheep and cattle by eating the limited supplies of pastures. They also damage fences and some graziers incorrectly believe that they foul pastures.

Where land is cleared and agriculture is intensifying, kangaroo populations must decrease in the long term as it is unrealistic to expect kangaroos to co-exist with cropping, irrigation or intensive pasture management.

**Compromising pest control and conservation.** When a landholder considers that kangaroos are a pest on his property, his objective is to reduce their number so that he can economically pursue his chosen form of land use. The licences that are issued to destroy protected fauna (kangaroos) for pest control frequently allow for more than the annual increase in the kangaroo population to be taken. This could, if pursued long enough, lead to the reduction and eventual removal of kangaroos from the property concerned. However, kangaroos have many refuges in the form of forests, national parks, and of grazing properties on which their presence is tolerated. From these refuge areas kangaroos frequently repopulate the original properties, much to the annoyance of the landholders concerned. Only in Tasmania has one of the large kangaroos become rare, the forester or Tasmanian grey kangaroo. The reasons for its decline have not been documented but it likely that shooting more than the natural increase in the population is responsible.

Fig 2. The difference in size of the male and female red kangaroo is clearly shown in this photo taken at Kinchega National Park.

Photo: J. Eveleigh.

**Methods of control.** In areas where the pest problem created by kangaroos is sporadic or seasonal, shooting is usually undertaken by the landholder. When the problem is severe he may organise a kangaroo drive in which the kangaroos are driven past a group of shooters waiting in ambush. The carcasses are then stacked and burned and there is no method of assessing or controlling the number of kangaroos killed.

**2. Professional Pest Control.**

If the demand to destroy kangaroos and the number of resulting licences issued in a locality is sufficient, then a professional shooter is permitted to operate. In this situation kangaroos are taken by a professional shooter as a by-product of pest control and the landholder is relieved of the management expense of destroying the kangaroos himself. He therefore frequently tolerates a larger population of kangaroos because he believes the natural increase in population is under control. Techniques for monitoring kangaroo populations are discussed under the section in extensive husbandry.

Most professional kangaroo shooters use four-wheel drive vehicles with a 100 watt spotlight mounted on a handle through the roof. Above the vehicle tray is fixed a framework to which butcher's hooks are attached. These are used during the evisceration of the carcasses which takes place in the field soon after the kangaroos are shot.

The most popular rifle is the .222. It is fired from the driver's seat to increase accuracy. The windscreen is often removable and a rest is built to support the rifle barrel. At the end of a night's shooting, between 20 and 100 kangaroo carcasses are delivered to the chiller and sold for $0.14/kg to be boned out as pet food. The shooter receives between $1.50 and $6.50 for each carcass in 1973 and the frequency of occurrence of carcass weights is shown in Figure 5.

All stages in the commercial operation are licensed and in most States the shooter must attach a tag to each carcass (which includes the skin), to show that he has paid a

royalty and that the kangaroo has been shot legally. The shooter then sells the kangaroo carcasses to a wholesaler who operates a chiller or freezing works. In N.S.W. each wholesaler is allocated an area in which to operate a monopoly, a procedure which reduces the risk of over-exploitation due to competing commercial interests.

The zones are large because in the agriculturally intensive areas the kangaroo industry must be flexible so it can move into an area, reduce the population at the request of graziers and then move out. An example of this function is seen in the New England district of New South Wales, where itinerant shooters will soon have to move on to other areas where the kangaroo populations have built up again from forests and refuges and their numbers are once more causing concern to graziers.

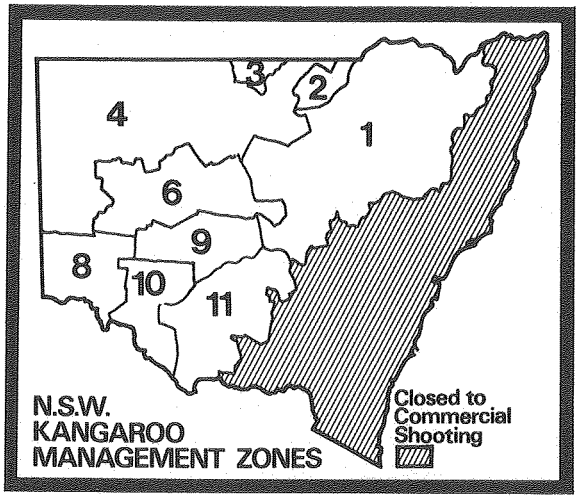
### 3. Extensive Husbandry

The discussion so far has centred on kangaroos as pests and has described the existing situation. Here the extensive husbandry of kangaroos will be considered and their value as an additional grazing animal examined.

The arid zone of rangelands comprise 74% of Australia and are defined as those areas of the continent where rainfall on a given piece of land is inadequate for economic production or pasture improvement.

The red kangaroo is distributed throughout this area and has several adaptions not possessed by domestic stock. The latter often being in conflict with the ecosystem both to their own detriment and that of the soils and vegetation on which they depend.

Fig 3. Map showing zones allocated to kangaroo wholesalers in N.S.W.




There is little scientific basis for any argument against the economic utilisation of native animals provided it is carried out under strict control and is based on biologically sound management principles. Indeed many scientists believe that the grazing of kangaroos deserves serious consideration as an additional form of land use, especially in the arid zone.

Thus Professor Sharman states that much more needs to be known about all aspects of the physiological ecology of herbivores both wild and domesticated in order to determine the most efficient producing animal. Drs. Griffith and Barker concluded that sheep, red kangaroos and grey kangaroos prefer different species of grass and eat differing proportions of dicotyledons.

In the past the arid zone has been exploited and the profits measured on a short-term annual basis. In an attempt to minimise this exploitation of a fairly fragile environment, limits on the stock carrying capacities of properties and restrictions on the clearing of timber were imposed. The productive potential of the red kangaroo in this modified agricultural ecosystem has not been investigated but its apparent adaptions must be considered in determining the most efficient grazing animal if the ecosystem is to be utilised efficiently.

**Adaptation to the arid zone.** Arid zone animals would benefit from having a low food requirement and a capacity to conserve metabolic stores. It has been postulated that red kangaroos and other arid zone marsupials achieve this by having, like all marsupials, a level of metabolism which is 30% lower than that of placentals, such as sheep and cows, of the same weight.

Kangaroos are semi-nocturnal and graze in the early morning and evening, although on overcast days they remain active for longer periods. During the heat of the day they lie in the shade, thus conserving water and energy. Red kangaroos become very mobile in a drought and will travel considerable distances to reach a storm site. By eating the rapidly growing green grass before it has time to decompose they maximise the ephemeral resources of the arid zone. Sheep on the other hand will not move more than about 8 km from water.

Red kangaroos have no breeding season and breeding activity is controlled solely by the availability of green feed.

The young kangaroo does not receive priority for survival in times of stress. During the drought in New South Wales in the early 1960s 83% of red kangaroo pouch young failed to reach maturity. In Queensland it was shown that no grey kangaroos born during a drought in 1965 survived. Kangaroos are suited to survive a drought because delayed implantation increases the possibility of there being pouch young alive at the end of the drought. Kangaroos are thus able to avoid pregnancy toxaemia and various metabolic diseases that afflict sheep, which give priority to the nutrition of their offspring.

In walking or moving slowly during grazing, kangaroos distribute their weight over a large pad attached below the tarsal bone. Sheep, goats and cattle have small hard feet and distribute their weight over a much smaller area than the kangaroo and are, therefore, more likely to damage vegetation and encourage soil erosion.

**Comparison of kangaroos and domestic stock as economic producers.** Although kangaroos have adaptions which appear to favour the arid environment, these same adaptions do not necessarily favour commercial production. For example kangaroos have slower growth rates than domestic stock, a factor which is probably attributable to their lower levels of metabolism and that both the dry food and water intake of kangaroos is considerably less than that of placentals of the same size. However, the proportion of meat production per unit of live body weight of kangaroos is greater than that of cattle; more than 50% of the live weight of the carcass is muscle which compares very favourably with 32% for cattle and 27% for sheep.

| | Red Kangaroos | Cattle |
|---|---|---|
| Average body weight at 2½ years of age | 24 kg | 450 kg |
| Carcass weight | 16 kg | 230 kg |
| Weight of muscle | 12 kg | 144 kg |

For this comparison to be taken further the efficiency of producing the carcass muscle would have to be studied and the economic returns of the two meats considered. Further, the economic return per acre of the other herbivores should be compared to enable wool production from sheep to be compared to meat production from either cattle, kangaroos or possibly goats.

On an average property in the arid zone at present, sheep and cattle are more profitable grazing animals than kangaroos.

Nevertheless, in good seasonal conditions, the red kangaroo utilises species of grass not grazed by sheep or cattle. This indicates that a return from kangaroos could be obtained from properties running cattle and sheep at existing kangaroo population densities and it is probable that this return could be increased without any need to reduce stocking rates of sheep and cattle.

**Annual harvest rate.** The extensive husbandry of kangaroos requires that the licences issued and the number of kangaroos taken each year represents only the annual increase in the population. This calculation of excess of births over deaths takes into account that under moderate seasonal conditions, 25% of kangaroo pouch young die in their first year and that the mortality rate for kangaroos of all ages due to causes other than shooting is 15%. With these assumptions, it is possible to take commercially 15% or one-seventh of the population every year and still sustain population stability. Under more intensive management a

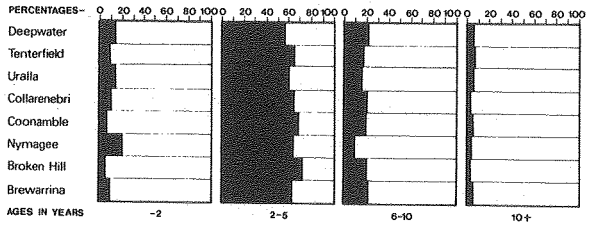



Fig 4. Age structure of Grey Kangaroo populations from eight areas of N.S.W. in 1973.

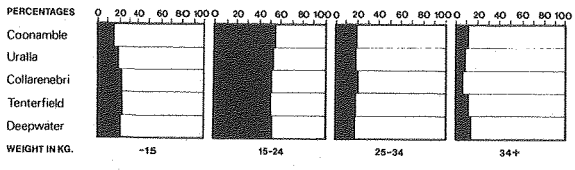



Fig 5. Frequency of occurrence of Grey Kangaroo carcass weight from five areas of N.S.W. in 1973. Classes expressed as percentages.

higher percentage of the total kangaroo population is harvested by selecting a high proportion of males and young animals. Harvests of 25-30% are probable under this type of management.

**Estimating populations.** If commercial utilisation of kangaroos in the arid zone is to continue to be a form of extensive husbandry then knowledge of population size is essential. Unfortunately estimating kangaroo populations is more complex than estimating populations of domestic stock. Kangaroos are semi-nocturnal and do not form herds.

It is not possible to count them in a conventional way through a gate because they are very difficult to yard. Kangaroo population status is assessed in the following ways:—

**1. Monitoring the hunting effort by professional shooters.**

This consists of recording:—

(a) Group size, numbers seen and numbers shot per kilometre travelled.

(b) The proportion of the population sighted by shooters which lies within the carcass weight limit.

**2. Daylight censusing of kangaroo populations.**

This is done in two main ways:—

(a) Before issuing licences to destroy pest kangaroos, rangers make assessments of kangaroo populations on the property concerned by:—

  (i) recording the number of kangaroos sighted per known distance travelled;

  (ii) recording the density of kangaroo signs —dropping density, footprints at watering points, and damage to fences or crops.

(b) Counts are also made from motor vehicles and aircraft along fixed transects in national parks, nature reserves and wildlife refuges.

**3. Estimations of the age structure of kangaroo population shot commercially.**

(a) Kangaroo skulls are collected at several country centres and sent to Sydney for ageing. Several thousand are processed each quarter.

(b) Correlations of age and carcass weight.

A sample of the results of the age structure and carcass weight analysis is given in Figures 4 and 5. It shows a constancy which implies that the dynamic forces shaping the age distribution are the same in different areas.

The population densities of kangaroos vary so greatly according to the type of habitat and seasonal conditions that it is difficult to give any average figures. Nevertheless the following figures have been developed as guidelines for New South Wales. In cultivated higher rainfall areas (over 800 mm) and where pastures are managed intensively, kangaroo populations are lowest. Along the 500 mm rainfall isohyet, an average 5000 hectare property has about 300 kangaroos; a 5000 hectare property along the 200 mm isohyet has approximately 75 kangaroos.

Professional shooters only shoot adult kangaroos because juvenile animals are uneconomic to handle and shooting of juveniles is prohibited by weight restrictions in N.S.W. Surveys conducted in New South Wales have indicated that a large percentage of the population of red kangaroos sighted is spared from shooting by the provision of these weight restrictions. The following table summarises the results of these surveys:

| | Grey kangaroos | Red kangaroos |
|---|---|---|
| Number sighted | 1,746 | 1,111 |
| Legal carcass weight limit | 12 kg | 20 kg |
| Number shot | 359 | 154 |
| Percentage shot | 24 | 14 |

Table 2. Table indicating way in which weight limits restrict numbers of kangaroos shot.

Grey kangaroos are not very accessible because their habitat is forested and hilly whereas the red kangaroos live on open flat plains. These surveys show that this difference in accessibility is more than compensated for by the higher weight limit on red kangaroos. A second effect of the weight limit is that it allows only males to be shot and ensures that the red kangaroo population has a greater reproductive rate than if equal numbers of both sex were shot.

**Market boycott.** The scientific evidence indicates that in the arid zone graziers should be able to supplement their incomes indefinately by shooting the annual increase in kangaroo populations on their properties. To this day they can either equip themselves or charge professional shooters a levy to shoot on their property. Several graziers have been harvesting off their own properties for many years and one is established as a wholesaler under the N.S.W. licensing system. He has a boning-

out works on his property which is licensed by the New South Wales Department of Public Health as a knackery. He skins and then bones out the kangaroos; the meat is supplied directly to pet shops in Sydney, and the skins are sold to a fur trader.

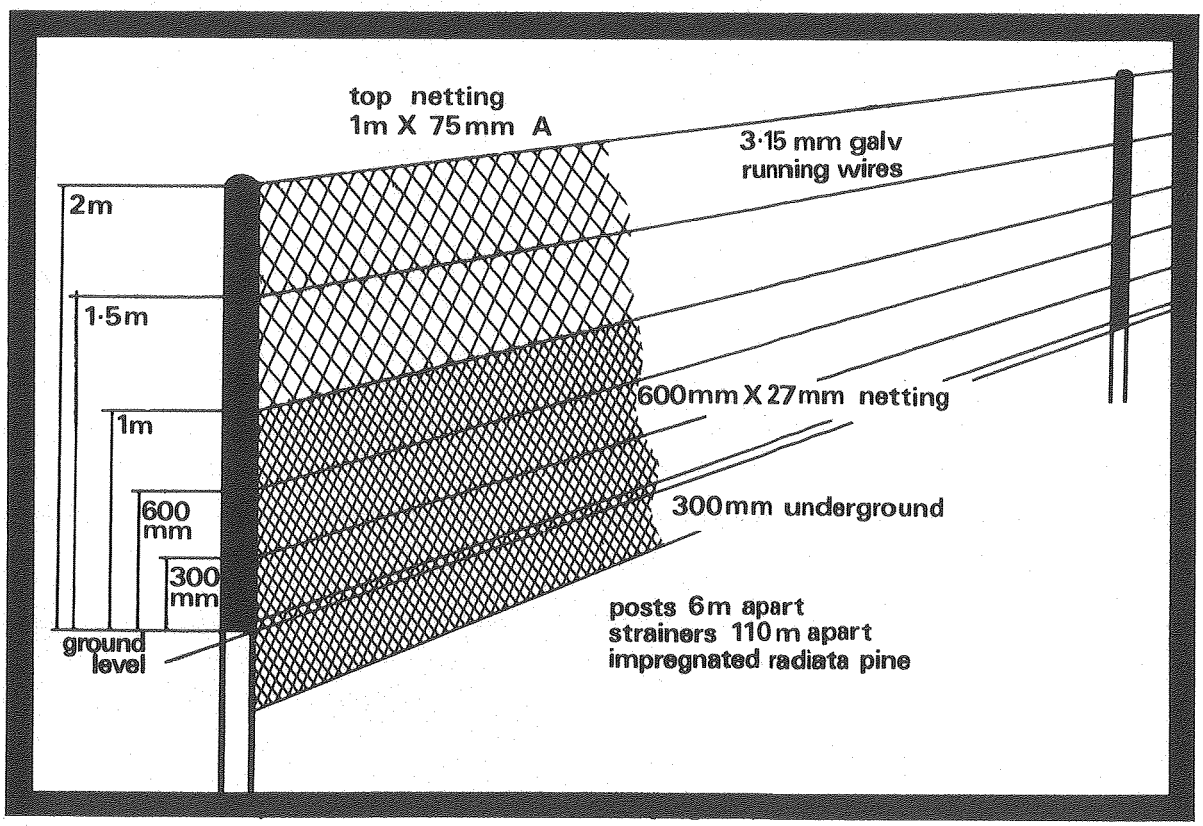
Expansion of this type of activity is being inhibited not only by the belief that kangaroos are pests but also by market prejudices. There is an emotionally based movement to boycott the use of kangaroo products. The market for kangaroo meat, which is at the present time restricted to fresh meat sold over the counter of pet shops, has contracted in the last few years. The canned pet food industry has ceased buying kangaroo meat so that it can base advertising campaigns on the fact that kangaroos are not used in the manufacture of particular brands of canned pet food. Foreign governments are considering banning the import of kangaroo products and the Australian Government has banned their export but the decision will probably be rescinded. Thus well-intentioned public movements and the resulting advertising campaigns are having a serious effect on the utilisation of a valuable natural resource and in New South Wales professional shooters cannot market the number of kangaroos which they are licensed to shoot.

**4. Intensive Husbandry.**

Intensive kangaroo husbandry involves high input management procedures similar to those used in sheep and cattle management to improve farming efficiency and increase the value of the product. Intensive husbandry would reduce two factors which make the gross return from kangaroos less than that from sheep or cattle. Growth rates would be improved and a greater percentage of the population could be taken annually by altering the sex ratio in favour of breeding females. Nevertheless intensive husbandry can hardly be advocated while the discrepancy between the economic returns of sheep, cattle and kangaroos is as large as it currently is. Nevertheless, for the information of persons who enquire on the subject and in the hope that an equitable price will become available for kangaroo products some problems of intensive husbandry and their possible solutions are now considered.

**Ownership.** Native fauna belongs to the Crown under the various State Fauna Protection Acts; in New South Wales all shooting of kangaroos is controlled by the State. A grazier

Fig 6. Illustration of type of fence necessary to confine kangaroos.



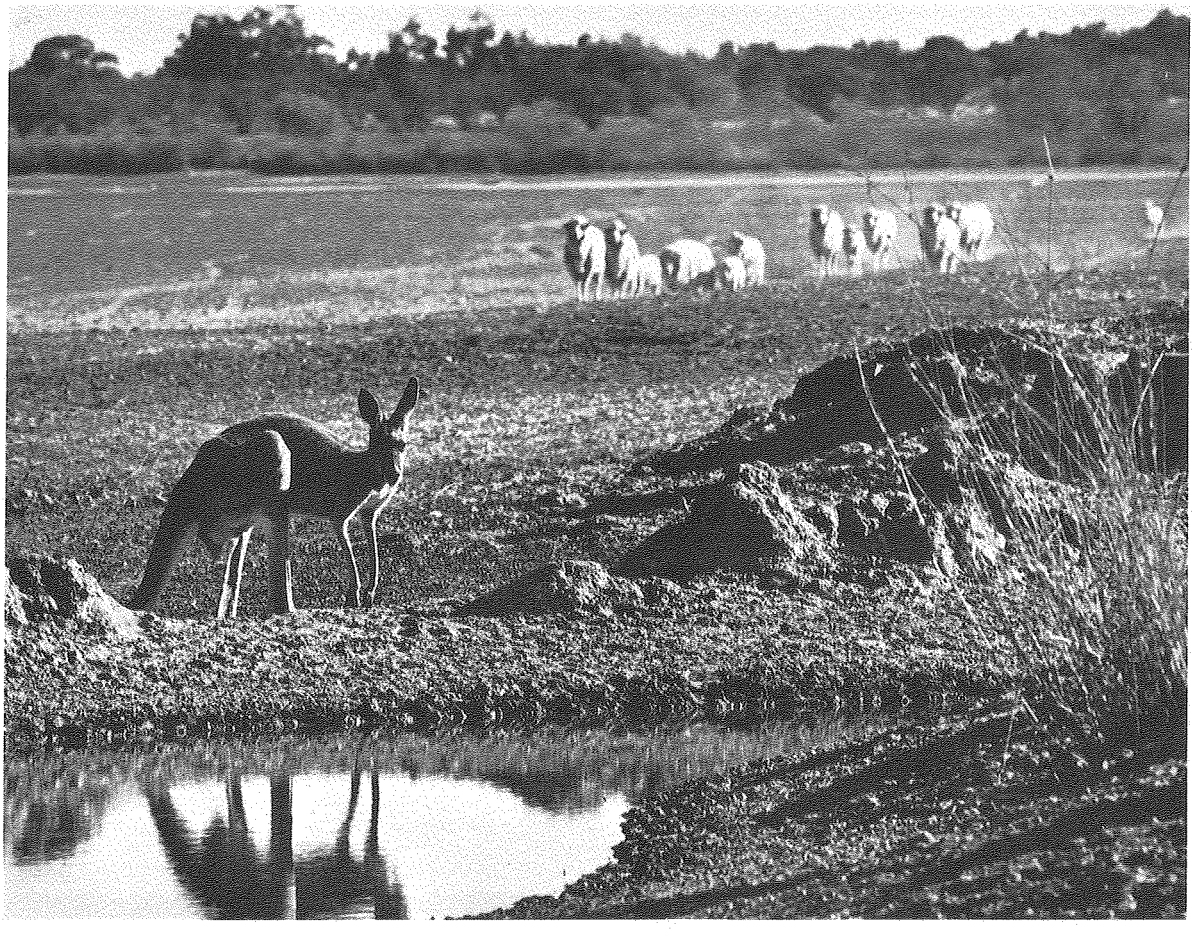
planning to graze kangaroos commercially, therefore, does not have legal control of the rate at which he harvests them, nor can he legally retrieve kangaroos which move beyond his property. He could build a kangaroo-proof fence to confine them but these are expensive, costing approximately $1,000 a kilometre. The cost of confining kangaroo movements could be reduced by using high tensile fences, salt licks, lucerne plots or green grass produced by irrigation or burning unpalatable long dry grass.

**Handling.** A serious obstacle to the intensive husbandry of kangaroos is the difficulty experienced in handling them. Their temperament and mode of locomotion do not facilitate handling by the conventional methods developed for sheep and cattle. To ear-tag or place collars on kangaroos, it is necessary to catch each one individually, which is expensive. Kangaroos can be caught by driving them into nets erected across a frequently used pathway. Alternatively they can be caught in traps erected around watering points.

Tranquilliser guns are being used to catch kangaroos. There are, however, problems associated with the delivery of the drugs because of the relatively small size of the kangaroo compared with African game animals, and the inaccuracy of the currently available methods of delivery. Also the bipedal locomotion and fragile necks and limbs of kangaroos predispose them to injuries when they collide with trees and fences while under the influence of the drug.

**Abattoirs and Health Standards.** The large difference in the retail prices of kangaroo and beef is attributable to one product being used for pet food and the other for human consumption. It is unlikely that kangaroo meat would ever become readily acceptable to Australians because of prejudices. However, a gourmet presentation in competition with venison, for which New Zealand shooters receive $1.40/kg, or a low cost meat suitable for the Asian market, are two marketing possibilities which could be developed.

Fig 7. Where kangaroos occur on agricultural properties it is necessary to include them in the overall management programme. This usually means controlled harvesting as normally accepted with livestock. Photo: Edric Slater. C.S.I.R.O.



Kangaroos are not inspected ante-mortem and are classed unsuitable for human consumption because under existing harvesting procedures they are shot in the field. In addition boning-out works are not sufficiently clean to be registered as abattoirs although they must reach certain standards to be registered as knackeries. Rabbits shot in the field, cleaned and taken to chillers are sold for human consumption which is an anomaly because kangaroos pass through similar channels and yet are unacceptable. Deer shot from helicopters in New Zealand are given a game meat licence and exported, particularly to Germany. Kangaroo carcasses would easily attain similar standards if a game meat export licence were introduced here.

Alternatively, if kangaroos were delivered live to an abattoir for slaughter the quality of the product could be upgraded. However it would not be possible to kill the kangaroos while they were under the influence of a drug because the meat would contain residual quantities. One drug which is sufficiently quickly metabolised not to pose this problem is succinyl choline. However, with this drug it is difficult to judge the correct dose.

Some of the problems associated with health standards would be overcome if the meat were canned because pressure cooking and canning sterilises meat.

**Breeding and Selection.** No artificial selection has been exerted on kangaroos so there is great genetic variability of body size, muscle weight and skin quality. The potential of these gene pools is enormous and presents the possibility of artificially selecting kangaroos which have greater commercial value such as higher growth rates, longer coats and coat colour variations. If wild populations were to be maintained, however, great care would have to be taken to prevent mixing of the wild and artificially bred populations. Care would also have to be taken not to unintentionally remove the kangaroo's inherent adaptions to its environment.

Pouch young of the preferred mating could be taken and fostered in receptive pouches of other females to rapidly produce a large number of offspring from two favoured parents. In cattle and sheep this type of selection requires internal surgery of both donor and recipient.

**Disease Control.** Kangaroos being intensively husbanded on improved pastures may be more susceptible to diseases than wild kangaroos because these conditions facilitate transmission of disease and the animals lose some of their natural immunity. In wild populations the level of parasite infections is very high and this could lead to disease outbreaks once these animals were moved into intensive conditions. A simple method of drenching kangaroos would be by injection. Little is known about diseases of kangaroos but they appear to be of low incidence in wild populations. It is possible that the incidence is higher and that the victims do not survive to show chronic symptoms.

## CONCLUSION

The overriding consideration in any kangaroo management programme must be the animal's conservation. There can be no compromise against the kangaroo's importance to Australians—particularly in this new climate of concern for our flora and fauna. However, from a conservation and aesthetic viewpoint it is undesirable to have all kangaroos confined to national parks and nature reserves. And, this article has shown that when kangaroos occur on agricultural lands they must be considered in terms of the overall land use system. This means they must be managed and their numbers controlled—as with other animals on the property.

In the long term, for kangaroos to continue to be widely distributed on private property the landholder must gain some benefit from their presence. For this to occur the current trend, by some groups, to force an end to the commercial use of kangaroos will have to be countered. Indeed, investigations should be undertaken to determine the suitability of kangaroos for the production of higher valued products. There is already sufficient evidence to warrant such a full scale investigation. In the meantime, the policy of carefully controlled licensed harvesting based on the kangaroo's ecology, plus the system of national parks and nature reserves, ensures the animal's conservation.

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