Overview of the Queensland macropod industry

Marsupials provided much of the protein requirements of Aboriginals in Australia together with reptiles, birds and other fauna. Many marsupials can provide much more than just protein. Skins, furs, bone, teeth and particularly sinews are all incredibly useful for a variety of reasons. Early European authors described cloaks `worn by aborigines made from kangaroo or wallaby skins sewn together with sinew' (Simmonds 1877). It is reasonable to assume that items made from animals were not only used but traded together with other commodities such as beetlenut, ochre and stone tools (Kerwin 2010). Some authors have suggested that aboriginals didn't just hunt macropods and other fauna opportunistically but managed land to improve hunting success and yield. Though not the first to hypothesise this process, Tim Flannery (1997) provides an eloquent account of 'firestick farming'.

Early colonial settlers in Australia utilised and exploited macropods extensively. Initially domestic livestock was valuable as breeding stock therefore supplanting protein supplies from hunting native wildlife, particularly the larger macropods, was vital to the successful establishment of colonies. Macropods were used for skins as well as meat (Dawson 2012). The Governor of New South Wales applied a tax to kangaroo skins as early as 1802 (Shepard and Caughley 1987). However as the colonies in each state established and domestic herds of sheep and cattle grew the reliance on wild harvested meat decreased. Still in 1877, Mrs Millet wrote 'Kangaroo venison still retains an honoured place at all tables in the interior'. (Simmonds 1877).

It is widely acknowledged that the large macropod species benefitted from widespread pastoral practices (Frith 1979, Lavery 1985, Caughley et al. 1987, Dawson 2012). Macropod numbers increased during the mid-19th century to the extent that the pastoral industry lobbied the various governments of the day to destroy marsupials. An Act to facilitate and Encourage the Destruction of Marsupial Animals was passed in 1877 in Queensland with similar legislation passed in New South Wales in 1880 (Shepard & Caughley 1987). The name of these Acts were changed many times but are collectively remembered as the Marsupial Destruction Acts (Hrdina 1997). The intention of these Acts was to exterminate kangaroos and wallabies from farming lands. In Queensland, funds were raised by regional boards which were augmented by the government. The boards paid licenced 'scalpers' a bounty on each scalp presented for kangaroos, wallabies, wallaroos and pademelons. Between 1877 and 1906, bounties were paid on 7,835,175 marsupial scalps with a total value of £1,187,000 (Hrdina 1997). Most of the culled marsupials were the red kangaroo and eastern grey kangaroo that also dominated the commercial harvest during the same period. The Acts required landholders to continue destroying marsupials after 1906 but their commercial value was greater than the bounties paid and was considered sufficient motivation for harvesters to continue taking macropods (Lavery 1985, Hrdina 1997).

During the 1800s, leather was a valuable commodity on international markets and macropods were found to have excellent leather qualities. Kangaroo skin is now widely accepted to make the strongest leather for its weight of any species in the world. The increase in macropod numbers during the expansion of the pastoral industry in the 1800s combined with a growing population of rural workers created an environment where large volumes of skins could be sourced to supply a commercial export market. The actual numbers harvested for the various species during the nineteenth century aren't known as the industry was unregulated. What records are available are from trading centres and demonstrate that harvests were very substantial. It has been established that 500,000 macropod skins were traded through Melbourne each year in the late 1800s (Dawson 2012). There were trading centres in most Australian capitals in the nineteenth century exporting directly to markets in Europe and North America. The commercial harvest of macropods across the whole of Australia is likely to have exceeded 1 million per annum during the late 1800s.

Biological potential of macropods

The commercially harvested macropods in Australia can breed at any time of year when seasonal conditions are right. In the south of the continent the eastern and western grey species have a peak breeding period between October and March each year but this is less pronounced in Queensland (Dawson 2012). While there are some minor differences between the harvested species, essentially females can begin breeding from 18–24 months of age and males can breed from 24–48 months of age. Seasonal conditions can have a significant impact on the age when macropods can first breed (Dawson 2012). There are also minor differences between species for gestation period, first exit from pouch, age of weaning etc. Together these factors contribute towards the intrinsic rate of increase of macropod species. That is the maximum amount of population growth that can occur when food, water and shelter are in unlimited supply (Caughley and Sinclair 1994). All commercially harvested macropods species in Australia could theoretically double in population size every two years under ideal conditions. Populations have been recorded as growing at almost this rate in Queensland in favourable years (figures 1 and 2).

Mortality of wildlife can take many forms including disease and predation, both of which can be greatly exacerbated by stress induced by lack of food or water and or extremes of temperature. These factors are environmental effects that work together to limit the potential maximum rate of increase. The observed rate of increase of a species is rarely the intrinsic rate due to the environmental effects on a population. From a management perspective the population dynamics of a harvested species are best calculated from survey data collected over many years. Fortunately this kind of data has been collected by all Australian states where commercial harvest of macropods occurs. Caughley et al. (1987) compared rainfall in western New South Wales with macropod populations and calculated an average rate of increase of 30–35% in average rainfall years. The maximum observed rate of increase for red kangaroos was calculated at 45% per annum but in drought years populations could decrease at 55% per annum. Using more recent population estimate figures from Queensland we can see that these calculations are shown to be accurate. For example, figures 1 and 2 show population increases for eastern grey and red kangaroos over the years 1997 to 2001. Figure 3 shows the estimated population size of all three commercially harvested macropod species in Queensland over a 22 year period. Clearly macropod populations can vary greatly with dramatic increases and decreases documented.

Figure 1 Example of estimated population growth for eastern grey kangaroos in Queensland based on aerial surveys results compared with a modelled population of eastern grey kangaroos. (Model assumes age of sexual maturity two years, maximum life expectancy 10 years, 90% breeding success and 5% mortality).

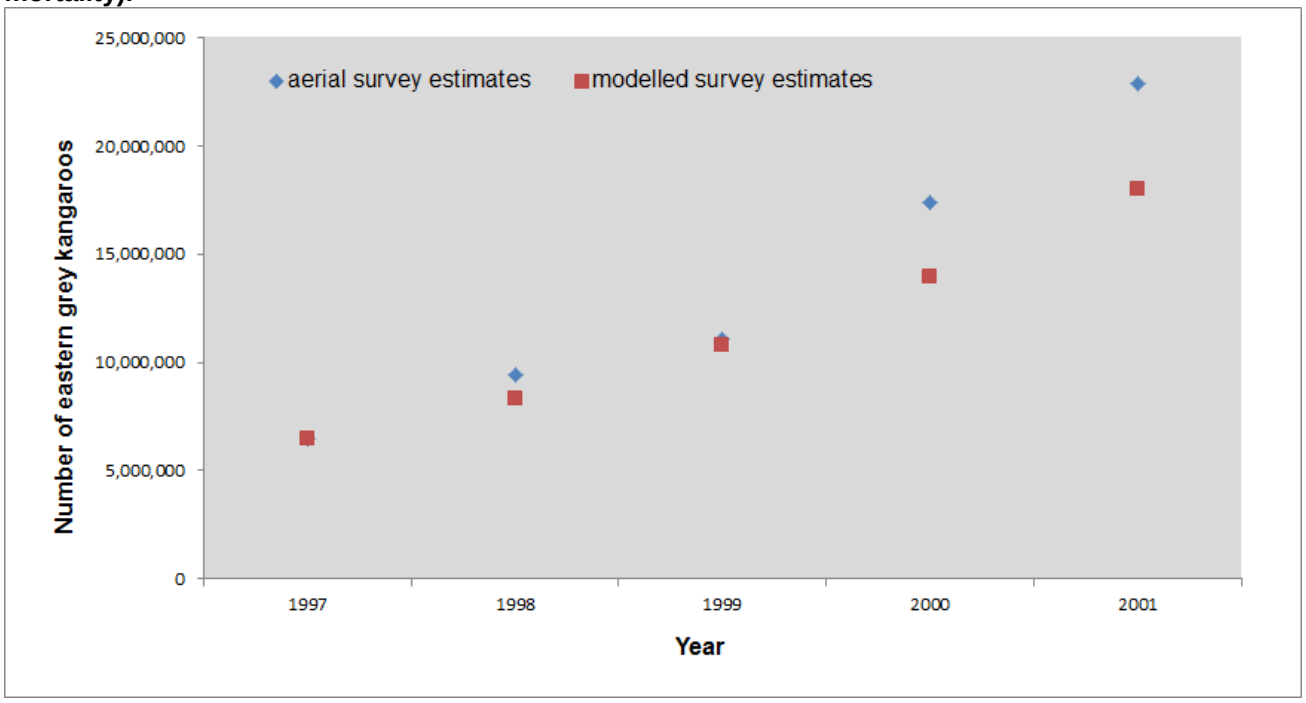


Figure 2 Example of estimated population growth for red kangaroos in Queensland based on aerial surveys results compared with a modelled population of red kangaroos. (Model assumes age of sexual maturity two years, maximum life expectancy 10 years, 90% breeding success and 5% mortality).

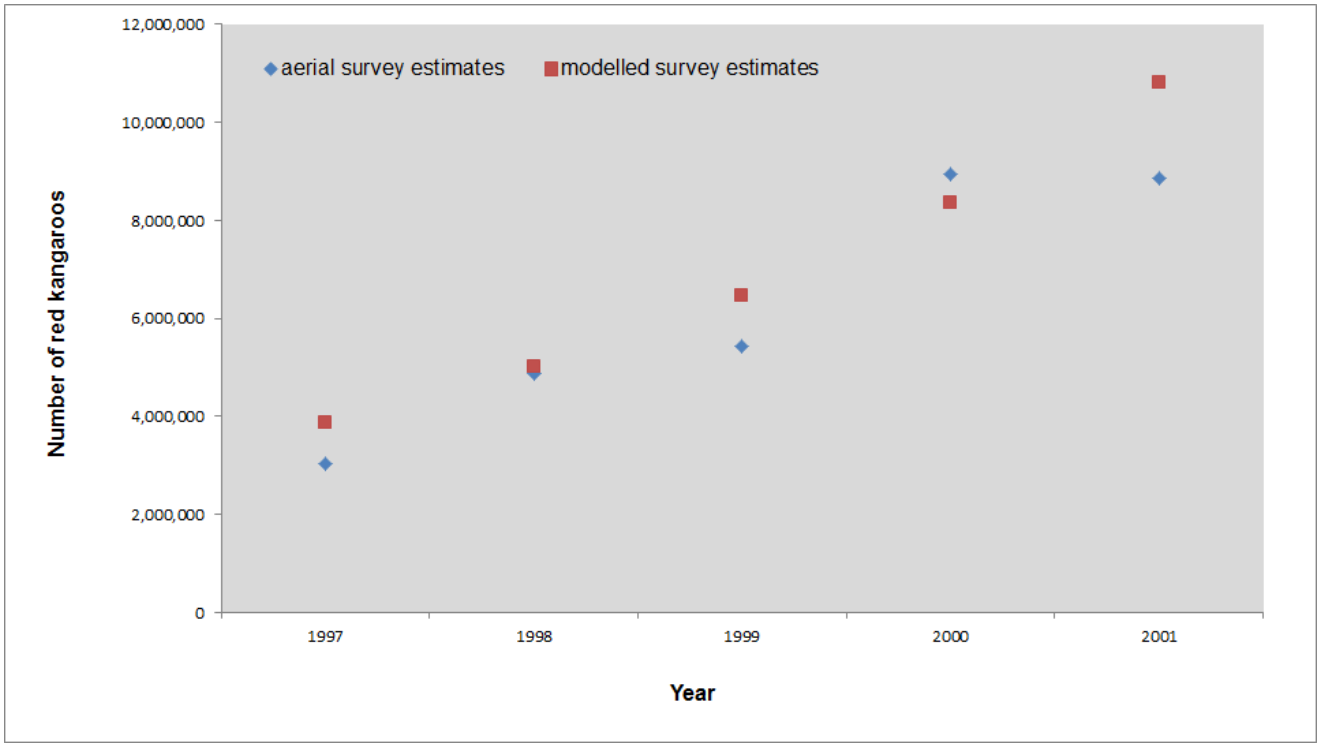
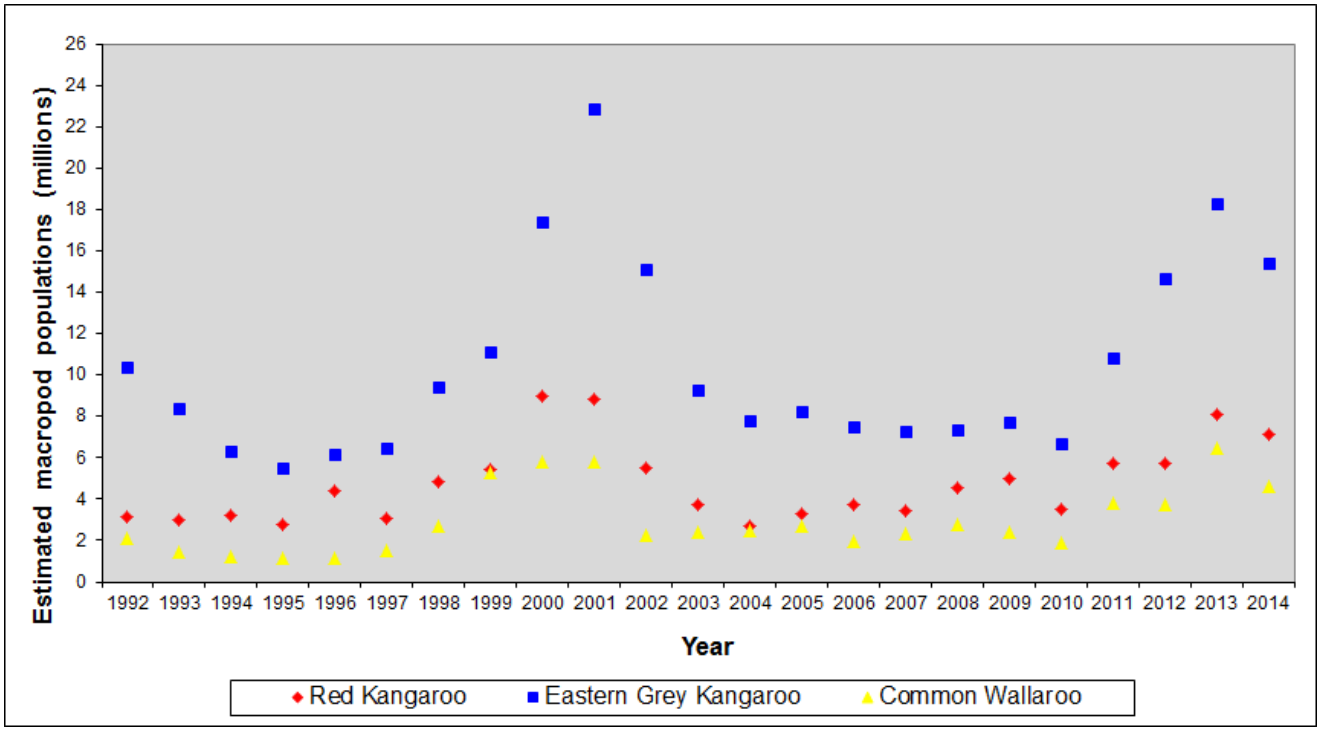


Figure 3 Estimated population size of three commercially harvested species in Queensland 1992 to 2014. (Source Queensland Department of Environment and Heritage Protection).



Current management of macropod harvesting in Queensland

Each Australian state is responsible for the management of wildlife under its jurisdiction. As such the regulation of the sustainable use of wildlife is also the responsibility of each state. However the Australian Government is responsible for the import and export of wildlife and wildlife products under the *Environment Protection and Biodiversity Conservation Act 1999*. In order for any commercial company to export a wildlife product the harvest of the wildlife must be covered under a Wildlife Trade Management Plan approved by the Commonwealth minister for the Environment. The goal of wildlife trade management plans are to ensure that the harvest of any wildlife is sustainable and based on the best available science.

The scale of the macropod populations and commercial harvests for each of the main harvest states are given in Table 1. The commercial harvest in Queensland is greater than the rest of Australia combined as are the size of the macropod populations. There are three main aspects to the Queensland macropod management program. These include monitoring the populations, setting commercial harvest quotas based on the estimated populations size and managing the harvest. Three species are currently harvested (Table 1) and the state is divided into four harvest zones one of which is a non-harvested zone.

Each year, the Queensland Government's macropod management unit conducts aerial surveys to estimate the size of the state's commercial macropod populations. These surveys are conducted from a helicopter flying at 60m high travelling at 50 knots (92.5km/h) with the doors removed. A detailed description of the methodology employed in these surveys is provided in Clancy et al. (1997).

Transects are between 50 and 90km long and fall within 22 monitoring blocks throughout the harvest zones. Every five years all monitoring blocks are surveyed but in the intervening years only 12 or 13 blocks are covered. Blocks that are not surveyed every second year are modelled for density changes based on the surveyed results of a paired survey block. Paired blocks are located in similar habitat and rainfall areas. The survey design factors in the size of the harvest in different areas of the state with more coverage for areas of historically high harvest activity. Surveys are conducted during the winter months during the first and last two hours of daylight available. These conditions maximise the likelihood of spotting crepuscular species such as macropods. The surveys provide an estimate of the density of macropods of each species in various habitat types throughout the state. This data is then used to estimate the population of macropods within each of the harvest zones.

Once the population size of each of the commercially harvested species is estimated for each of the commercial harvest zones a harvest quota is set for each species in each zone for the following year. Quotas are set between 10 and 20% based on the species and the degree of survey intensity for the zone. These sustainable-use harvest proportions are based on research and modelling undertaken by Caughley et al. (1987) and Hacker et al. (2002). The quotas set are the maximum number of animals that are allowed to be legally harvested and have little bearing on the size of the actual harvest in most years. Quotas fluctuate widely in line with population size whereas the harvest is influenced by commercial factors such as size of markets and value of Australian dollar etc. The reported commercial harvest of macropods has increased steadily since the industry was first regulated (Figure 4). Significant improvements to compliance with reporting requirements has occurred as well as an increased harvest.

To participate in the industry harvesters require accredited training before applying for a licence through the Department of Environment and Heritage Protection (the department). Once licenced, a harvester must purchase tags to be attached to every harvested animal. Each tag is individually numbered and has a corresponding barcode. They are colour coded for each species and labelled for the zone that they may be used in. The majority of the harvest in Queensland is for whole carcasses with the skin left on. These are sold at dawn each morning to a licenced dealer where they are weighed and stored in large refrigerated containers. These are emptied each week (or sooner depending on demand for product) into refrigerated trucks which transport the carcasses to a licenced processing works. Harvesters, dealers and the processing works must report each month a return of operations to the department detailing the number, sex and species of every macropod harvested and the tag number. Dealers also report the weight of all transactions whilst harvesters must also report the property of origin. In this way the department can track the harvest.

There is a small skin only harvest in Queensland accounting for less than 10% of the annual take. These macropods are usually harvested too far from a licenced dealer to sell carcasses. The same tags are attached to the skin of a harvested macropod which are stored salted until sold to a licenced dealer. The same amount of record keeping is required for those involved in the skin only harvest.

Harvesting of macropods in all Australian jurisdictions is bound by the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Commercial Purposes. The code is implemented by state regulation that refers to the code as the appropriate minimum standard that the industry must adhere to. The code outlines the minimum calibre rifle that can be used in the industry, where animals are to be shot and how to deal with pouch young and young at foot. Central to the industry is the requirement that all macropods must be shot in the brain only.

Queensland	2011 Estimated population	**2012 Harvest Quota**	2012 Actual Harvest
Red (Macropus rufus)	5,745,591	1,057,950	281,968
Eastern Grey (M. giganteus)	10,799,679	1,521,850	494,219
Wallaroo (M. robustus)	3,799,973	524,150	199,117
Total	20,345,243	3,103,950	975,304

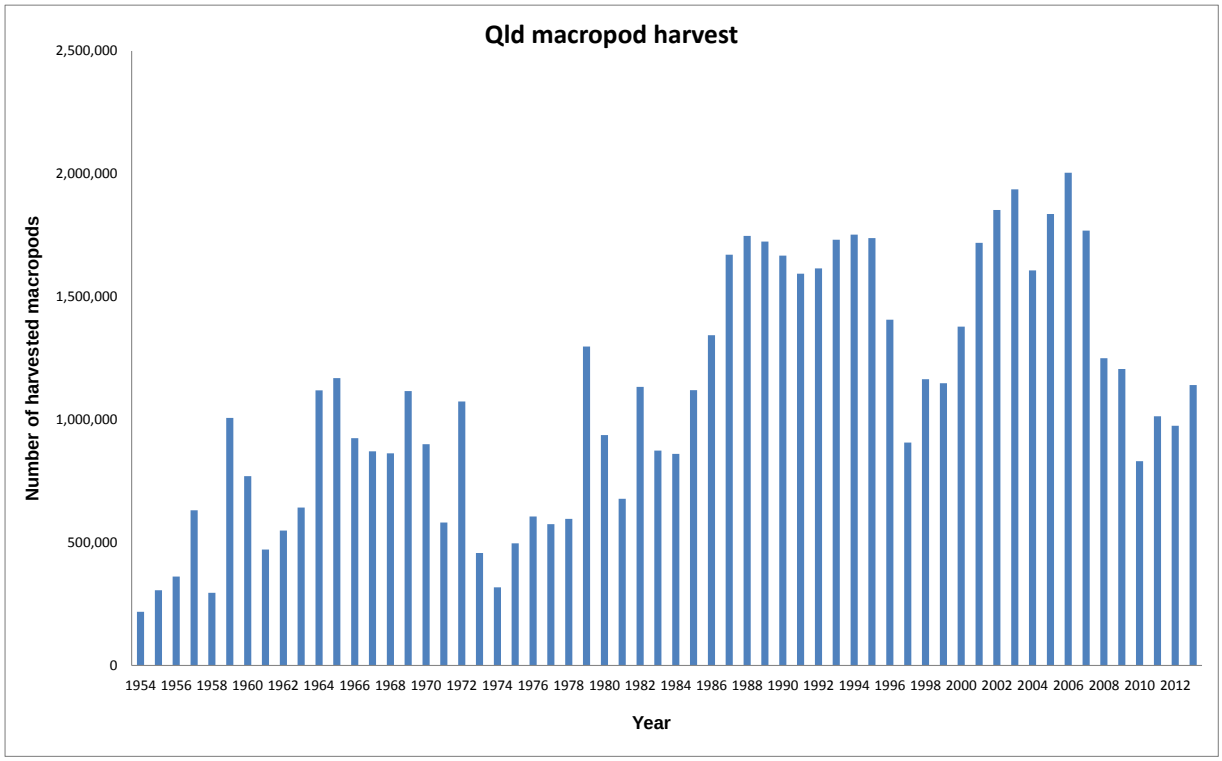
New South Wales	**2011 Estimated population**	**2012 Harvest Quota**	**2012 Actual Harvest**
Red (Macropus rufus)	3,972,522	675,329	134,893
Eastern Grey (M. giganteus)	5,258,104	782,349	177,296
Western Grey (M. fuliginosus)	496,059	48,435	18,339
Wallaroo (M. robustus robustus)	88,430	12,515	5,473
Total	9,815,115	1,518,628	336,001

South Australia	**2011 Estimated population**	**2012 Harvest Quota**	**2012 Actual Harvest**
Red (Macropus rufus)	1,158,000	225,300	82,117
Western Grey (M. fuliginosus)	674,800	94,000	32,570
Wallaroo (M. robustus)	494,800	72,800	7,614
Total	2,327,600	392,100	122,301

Western Australia	**2011 Estimated population**	**2012 Harvest Quota**	**2012 Actual Harvest**
Red (Macropus rufus)	638,185	95,000	34,104
Western Grey (M. fuliginosus)	1,177,534	140,000	92,876
Total	1,815,719	235,000	126,980

Table 1 Estimated population size, commercial harvest quotas and actual harvest figures for commercially harvested macropods in Australia for 2012. Commercial quotas are based on population estimates from the previous year. Data available from the Department of the Environment www.environment.gov.au

Figure 4 Reported commercial harvest of macropods in Queensland since the industry was regulated in 1954.



Conclusion

Marsupials are a very successful group of mammals that have evolved with breeding strategies that can produce an abundance of offspring under ideal conditions. The large macropod species have benefited greatly from pastoral development in Australia's rangelands. These species support the sustainable commercial harvest of approximately 2,000,000 animals from four mainland states each year. In Queensland, where the majority of the harvest occurs, the size of the reported harvest has grown since 1954 since official harvest records have been kept (Figure 4). Despite the scale of macropod harvesting the industry has little effect on the overall abundance of the species involved. Regulation of the industry ensures that the harvest is sustainable and regular population surveys clearly demonstrate this.

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