Aerial survey conducted from Telfer Mine site of the Rudall River National Park and its surrounds to assess feral camel densities

Draft Report
November 2006

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ABSTRACT

A broad-scale aerial survey of 78,500 km^2 was conducted around Telfer Mine from the 4th to 10th November 2006. This survey was used to assess feral camel abundance and was the first stage of a feral animal control initiative. This area included part of the little sandy desert to the north of Telfer and the entire Rudall River National Park and surrounds to the south. An additional area of 6500 km^2 over Balfour Down station was also assessed to test the effectiveness of camel culling, which had been done on this station in the preceding 12 months. The camel densities after correction for perception bias ranged from 0.21 to 0.31 camels per km^2 within the survey area. The mean of 0.26 was used to assess camel numbers and a population of 21,073 was determined for the study area. Balfour Downs Station had a lower density by almost two and half times at 0.11 camels per km^2 and showed a positive response to culling. The study area was very dry and camels were concentrated in big herds of 50-100 camels mostly concentrated on water.

INTRODUCTION

This survey was part of a biodiversity conservation initiative to measure and control pest animal species in the western portion of the Little Sandy desert. The most important outcome for this initiative was to reduce the impact of feral species such as camels, donkeys and wild horses on conservation lands and surrounding Unallocated Crown Lands (UCL). Rudall River National Park, which makes up almost 15% of the survey area, is known to have large herds of camels at various times. The increasing incidence of camel sightings from travelers through this area has raised the need to document specie numbers with a view to introducing some control measures. Feral camels are possibly one of the main threats to the conservation values for this area as it has been shown that once camel numbers exceed more than 2 camels per Km^2 damage to the vegetation can occur (Dorges and Heuckle 2003). Camel numbers from other surveys have been shown to be increasing annually and Edwards et al (2004) has indicated, from data collected in the Northern Territory that camels have increased at an exponential rate equivalent to about 10% per year with a doubling of the population every 8 years. This flags a looming environmental problem particularly as camels are known to browse on more than 80% of available plants in central Australia (Dorges and Heucke 2003).

The effects of grazing on the arid and semi-arid plant communities has been studied widely, most of the studies have concentrated mostly on domestic animals but some have also included native and feral species (James et al 1998).These studies have looked at grazing intensity and the findings from this research show that medium intensity grazing gives the best result with the highest abundance and species richness than either low or high intensities. The findings also show that high intensity grazing causes a loss of species richness and abundance. Other methods used to study the effect of grazing on arid land plants has been to examine changes in species composition, abundance and structure along a transect radiating out from a water source. This has shown that the zone immediately around the water source (0-400m) is degraded through trampling and heavy grazing and a second zone out from this is made up of dense unpalatable perennial woody shrubs. A decline in species richness and abundance of palatable perennial plants occurs in both these zones and beyond (James et al 1998). It has been generally accepted that the grazing patterns of camels result in a lower impact on vegetation and that their larger softer hooves reduce the effect of trampling on plants and soil structure (McCloy and Rowe 2000, Dorges and Heucke 2003). Feral camels are known to frequent salt lakes and are reputed to have a high dietary salt requirement (Ellard 2000). The impact on these salt lakes may be significant in dry summers if they contain water as camels may join to form large herds exceeding 100 in number (Edwards et al 2001 and observations this survey). A better understanding of the environmental impacts of feral camels is needed along with the development of an effective management strategy.

Rudall River National Park is jointly managed between the Department of Environment and Conservation and the Martu Aboriginal people. This provides an opportunity to work together to manage feral species such as the camel which may be impacting on

conservation and cultural values. Employment, education and an exchange of ideas is considered to be the main outcomes for the Martu people from a working liaison.
The aim of this survey was to:

1. Determine the density of camels within the survey area.
2. Provide a map of camel numbers and distribution.

METHODS

The survey area was selected to cover all of Rudall River National Park and its surrounds (figure 1) and was operated out of Newcrest Mine site at Telfer. Camel incursions into the mine site at various times in the year have also been a problem for Newcrest mining who readily agreed to a partnering arrangement. This was an enormous help to the logistical operation of the survey with Newcrest providing access to their airport and for arranging travel, accommodation and meals for the survey crews.

The survey area covered 78,500 km^2 and was systematically sampled with east west transects 11.1km apart (6' latitude). Each transect was 300km long starting at 121.30^{o}E to 124.30^{o}E with 24 transect lines extending from 21^{o}00'S to 23^{o}18'S (Figure 1). The aerial survey method follows that developed for surveying kangaroos and other wildlife populations (Eg Caughley and Grigg 1982, Pople et al 1998) and has been adopted and used as a standard method for camel census (Edwards et al 2004). A Cessna 210 high wing aircraft was used and fitted with radar altimeter and GPS (Global Positioning System). The survey was conducted at a height of 250 ft (76m) at a ground speed of 100kts (185 km/hr). Strips of 200m width on each side of the aircraft were delineated by a rope attached to specially fitted wire struts. The position of the rope was calibrated on the ground for each observer from tables and functions constructed for the purpose. The marker ropes were checked to confirm accuracy once airborne against two markers set 200m apart on the airstrip.

The flight crew consisted of pilot and three observers seated in the front right, rear right and rear left positions. The observers were rotated each flight and the tandem right observers counted the same transect independently. Species counted included camels (*Camelus dromedarius*), goats (*Capra hircus*), red kangaroos (*Macropus rufus*), horses (*Equus caballus*), donkeys (*Equus asinus*), emus (*Dromaius novaehollandiae*), bustard (*Ardeotis australis*), dingo (*Canis lupis dingo*) and cats (*Felis catus*), which were recorded onto data sheets designed for the purpose. Notes on flight path direction, temperature (^{o}C) and visibility were taken at the time of measurement. The protocol for this technique requires counters to count for 97.5 seconds followed by a 7 seconds gap where data was recorded onto prepared data forms. Each counting period is equivalent to 1km^2 and a timing device was used and set so that an audible buzz marked the end of the count period and was continuous for the 7 seconds gap. The 7 seconds recording time gave a 360m gap between cells where no recording was done. For camels, individual numbers and group size was recorded. In the 24 transects a total of 2592 cells were measured (1296 each side). An additional 216 cells were measured over Balfour Downs Station (108 each side) for comparison with a recently culled area.

Detailed analysis of this data will be carried out at a future date and estimates of camel density has been done using Edwards et al (2004) correction factors for perception bias. It is likely that each survey and group of observers would have their own correction factors. However, given that this method uses perception bias correction factors that are averaged across all observers and terrain we believe there will be reasonable agreement in this regard.

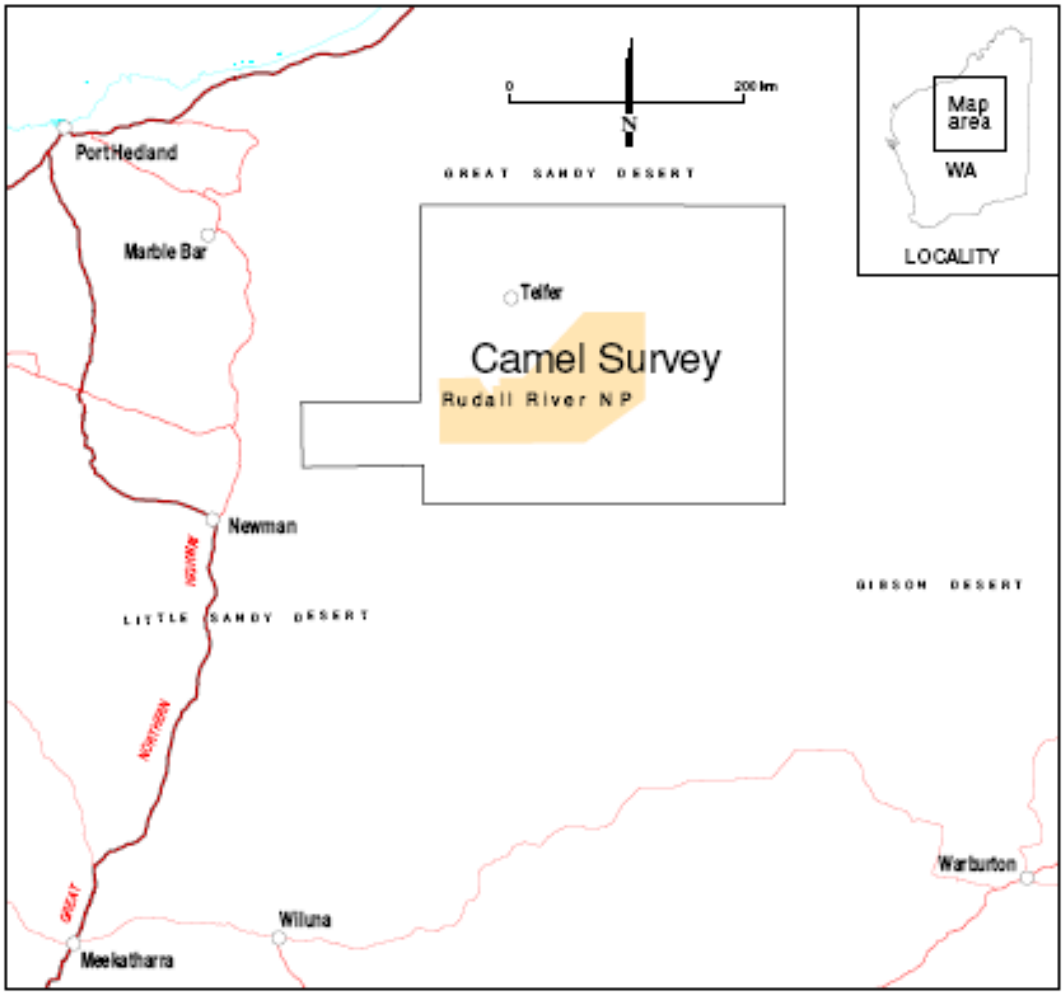

Figure 1: Map showing location of camel survey

RESULTS and DISCUSSION

The overall mean camel density determined for the study area and corrected for perception bias using Edwards (2004) correction factors was 0.26 camels per km^2. This gives an estimated camel population of 20,400 for the study area and when extrapolated for the known distribution area of camels in Australia equates to a population 728,000. This density of camels was found to be about two and a half times higher than that determined for Balfour Downs Station (0.11 corrected) where active camel culling has occurred in the preceding 12 months. This shows that culling efforts can have a positive effect in reducing camel densities and may be an effective method for selected areas of high value.

The mean group size was 5.3 camels and varied from 1 to 26 within the $1km^2$ cells measured. The study site was very dry and most camels were observed close to water and in large herds from 50 to 100 in number (see distribution map). Rainfall earlier in the year had been high with more than 400mm from October 2005 to March 2006 (figure 2).

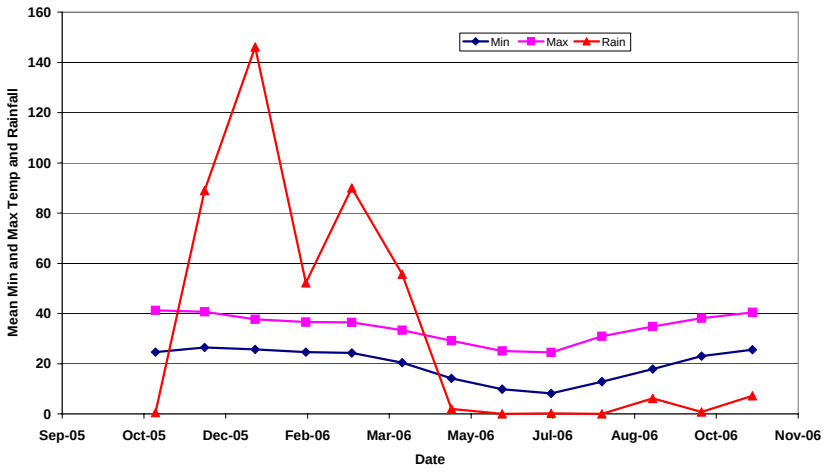

Figure 2: Telfer rainfall in the preceding 12 months showing high rainfall over the summer months followed by a very dry period leading up to the survey. Some scattered light falls from thunder storms during November 2006 had put water in some clay pans.

Camel numbers appear to be on the increase and this was demonstrated by Edwards et al (2004) from previous surveys, which showed that populations are likely to increase at about 10% per year. This is also evident from survey results listed (Table 1).

Table 1: Comparison of estimated camel populations extrapolated for each state where a camel survey has occurred and for Australia, showing an increasing trend in population from 1966 to 2006.

Study Area	Year	Estimated Population	Estimated Australian Population	Reference
NT, SA & WA	1966		15,000 – 20,000	McKnight (1966)
Western Australia	1972	Distribution only		Long, (1988)
Northern Territory	1979	3,000 – 6,000 (NT)		Letts, (1979)
Australia	1976	Distribution only		Murray *et at* (1976)
Northern Territory	1986	31,570 (NT)	100,000	Graham *et al* (1986)
Australia	1988		> 43,000	Short *et al* (1988)
Northern Territory	!994	60,000	200,000	NT Conservation Commission (1994)
Northern Territory	2001	80,533	300,000	Edward *et al* (2004)
South Australia	2005	16263	716,900	Peeters *et al* (2005)
Western Australia	2005	238,000	476,000	Ward *et al* (2005)
Western Australia	2006	364,000	728,000	Ward *et al* (2006)

(Adapted from: Kevin Ellard, (2000) Agriculture Western Australia)

At what point camel populations are likely to stabilise is not known as there are many factors favourable for continued increase such as, ample space, no natural predators and that they are an arid land specie and able to thrive in our arid environments. It is more likely that camel numbers will continue to increase with possibly the only potential limiting factor being access to permanent water. Given this scenario and that fact that the mean group size of camels exceeds 5 it is likely that browsing pressure will impact on vegetation species particularly close to and around water points. It may be necessary to protect or control camels in areas of high value such as, where rare plants may exist or culturally significant areas.

From the comparison between the survey area density of camels and that of Balfour Downs Station where Camel culling has occurred (0.26 vs 0.11) demonstrates that culling has the potential to reduce camel numbers and the impacts of browsing. For how long this reduced density persists is not known, although, camels generally disperse during times of wet and congregate on available water in the dry summer months or periods of drought. This could influence the effects of culling on a station where permanent water exist causing the effects to be nullified in a dry period by attracting camels off the desert in search of water. For example, large camel herds of 50-100 were observed during this survey mostly concentrated on water. Thunderstorms during the preceding weeks had put patchy areas of rainfall through out the study area and camel sighting were generally confined to places where surface water was available. If camel culling was considered to be the best option then targeting the dry times would be most effective when camels are congregated in large herds. However, given the rate of recruitment around 70,000 camels

would need to be removed within Australia every year just to keep the camel population at its current level.

Camels were observed from a previous survey to have a preference for certain habitats. These were around clay pans, wash areas that contained trees or shrubs and creek lines. These areas make up only a portion of the total area available and it appeared that less palatable areas such as Spinifex plains were only traversed. The dryness of the country in this survey made it difficult to confirm this observation. However, we plan to plot camel distribution over a vegetation map and determine the proportions of the land system that are utilised by camels. The amount of suitable habitat may also be a limiting factor on camel population and distribution. Further work is also needed to test the impact of camel browsing on species richness and abundance of plant species within the preferred camel habitats identified from the above mapping exercise.

CONCLUSIONS

- The camel numbers determined by this survey was found to be 20,400 at a density of 0.26 camels per km^2
- Comparison of camel density between the study area and a culled pastoral area showed a two and a half times reduction in camel density (0.26 study area and 0.11 culled pastoral station)
- The study area was very dry and camels were mostly concentrated in big herds of 50 to 100 on available water points.

ACKNOWLEDGMENTS

We thank the assistance extended by Newcrest Mining in providing travel, accommodation and meals for the survey crew and in particular thanks to Wendy Paterson for making all the arrangements and sponsoring the survey.

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