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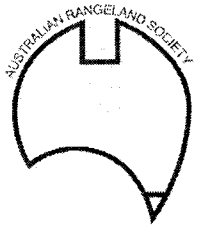

The Australian Rangeland Society

THE IMPACT OF RABBIT GRAZING ON THE SUCKER RECRUITMENT OF THE THREATENED SPECIES PURPLE-WOOD WATTLE (*ACACIA CARNEI*).

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INTRODUCTION

1.1 Scope

This paper aims to demonstrate the effect of the rabbit, post RCD, on the level of recruitment of Australian flora, in particular *A. carnei* as a demonstrative species. It has been found that in densities of only one rabbit per hectare rabbits are able to prevent the regeneration of native perennial plant species (Cooke 1991). Also, I have personally witnessed massive regeneration of both native flora and fauna immediately post RCD. A significant portion of which was lost to grazing by the residual rabbit population, which was and still is, less than 10% of the pre RCD level. The overall impact of RCD nonetheless has been massive regeneration, which has persisted over the last four and a half years despite it having been a period of ineffectual rainfall.

1.2 Acacia carnei

A. carnei is a small shrub or tree growing to 4 metres in height on sand dunes, level sandy sites or alluvial and aeolian accumulations along watercourses. It is limited to the Broken Hill region of New South Wales and the north east pastoral zone of South Australia. Mature trees can vary in age from 180 to 300 years. The species flowers in autumn, winter and spring, however flowering is very infrequent as it depends on rainfall. Generally seed viability is very low and seedling recruitments are rare. The production of vegetative suckers is more common, however these are generally lost to grazing by rabbits. Rabbits not only prevent regeneration, but they actively build warrens under adult plants, which may cause the plants to collapse and die (Auld 1992). *A. carnei* has a vulnerable status according to Schedule 2 of the Threatened Species Conservation Act 1995. The reason for this listing is that rabbits have prevented the regeneration of the species.

1.3 Rabbit grazing in the Western Division

Rabbits reached the Broken Hill region in the early 1880's and ran unchecked for seventy years (Lord 1994). Despite huge efforts by the land managers of the day, early attempts to control the rabbits failed. Severe overgrazing from rabbits continued until 1950 with the release of myxomatosis (Lord 1999). Anecdotal evidence reveals that there was no regeneration of many perennial native species from the period 1880 to 1950 in this region.

> "From the period 1880/90 to 1950 no young trees grew except prickly wattle (*Acacia victoriae*) and a few turpentine (*Eremophila sturtii*). After 1950 emu bush (*Eremophila longifolia*), sandalwood (*Eremophila platycarpum*), spotted fuschia (*Eremophila maculata*), mulga (*Acacia aneura*), nelia (*Acacia loderi*), quandong (*Santalum acuminatum*), bullock bush (*Heterodendrum oleifoluim*), black bluebush (*Mareana pyramidata*), hop bush (*Dodonea attenuata*) and native pine (*Callistris columellaris*) all regenerated." (Pers. comm. A. Bartholemaeus).

Therefore, even though sustainable stocking rates had long been established, 1950 was a landmark date in the history of the semi arid rangelands of Australia as it provided the opportunity for recovery of the fauna and flora (Lord 1999).

Two other major factors in addition to myxomatosis influenced the recovery of perennial native species:

- **Polythene pipe lines**, which allowed stock to be spread more evenly over the land; and
- **Motor transport of livestock**, which allows the movement of livestock at will. Previously, when dry periods occurred, managers often could not move stock out as the stock route itself would be drought stricken. (Lord 1999)

RCD was first confirmed in the district on the 13 November 1995, 80% of the rabbits on Thackaringa died with in the first 10 days, and another 10% - 15% over the following six weeks (myxomatosis also had a presence). As there had been useful rainfall in November there was a proliferation of native perennial plant recruitment in an unprecedented way. Much of that regeneration was lost to grazing from the remnant rabbit population, none the less, we have seen a very significant increase in many species over the last four and a half years despite an extended period of very low rainfall. RCD and myxomatosis have held the rabbit population at 10% or less of the pre RCD population.

2. Methods

2.1 The study site

The study sites were located on Thackaringa Station, located 40 kilometres west of Broken Hill, New South Wales, near the border of South Australia (S.32 04 176 E.141 00 750). The area is classified as a semiarid environment. The climate is one of low, aseasonable and variable rainfall with an average of 180 mm of rainfall received annually. Over an 86 year period 62 % of the rainfall for the Broken Hill region was below average, the average being punctuated by some large wet years. Summers are hot, with extended periods of temperatures over 40°C common. Winters are cool (Scholz 1995).

The Land Systems on "Thackaringa" include the Barrier, Nine Mile and Mundi Mundi Land Systems.

2.2 Trial design

Colonies of *A. carnei* occur on numerous sites on Thackaringa. However, these sites show only limited signs of recruitment over the past one hundred years or greater. Most of the colonies are made up of mature trees only. There are only one or two instances where there is more than one age structure within each colony. In these instances there are two age structures, the younger trees being a little over 1 metre in height (the combination of events that have allowed for this more recent regeneration is not fully understood). The colonies selected for this trial consisted of only large mature trees at the commencement of the trial. The colonies were not selected for this reason, but because they were large enough in which to establish a site

Each trial plot incorporates three grazing treatments:

1) Total Exclosure – which excludes all grazers. The fence is constructed out of wire netting and a top barbwire;
2) Partial Exclosure – which excludes all grazers except rabbits. The fence has been constructed with hinge joint fabricated fencing with a top barbwire, which allows rabbits only to pass in and out; and
3) Control – which is open to all grazers, including rabbits, kangaroos and livestock (sheep and cattle).

Each treatment consists of a 1 hectare block with specialised fencing for the partial and total exclosure treatments. These trial plots were replicated three times at different locations within Thackaringa. The sites were located in the Quarry, Cow and Montana paddocks. The trial plots were strategically placed around a mature stand of *A. carnei* trees so that sucker recruitment for the species could be monitored. Grazing treatments within the trial area were randomly allocated within the stand of *A. carnei*. In the total exclosure treatment plots rabbit infestation was eradicated.

The trial was set up in August 1998. An initial count of *A. carnei* seedlings was conducted. Progressive counts to monitor sucker recruitment were conducted at six and twelve months. Each sucker counted was pegged to alleviate any duplication when counting and for photography purposes to illustrate the recruitment of suckers. Counting and plotting of sucker recruitment was mapped to scale of the plot area. At the time of the fence construction no suckers were evident. By the time initial sucker count commenced, a lag of some three weeks after fencing was completed, a substantial number of suckers had appeared in the total exclosure plots.

Also, in the five weeks spent setting up the sites and doing the initial counts not one rabbit was seen, although some evidence of their presence was observed. All sites had rabbit warrens in them, thus in the total exclosures the rabbits had to be eradicated. This was successful in the Quarry and Cow Paddock sites. However, it proved very difficult in the Montana site, taking some two months to finally eradicate them using various methods. The effect of that rabbit grazing in the total exclosure plot is reflected in the results.

Plots are less than one hectare but do vary slightly to fit in with the A. *carnei* plants. For example, the Quarry paddock total exclosure plot is 90m x 100m. Most other sites are 90m x 90m. The reason that this size was selected was that some areas were not able to fit in 100m x 100m plots, so to be consistent the plots were made around 8,100 square metres.

2.3 Statistical Analysis

The trial tests the following null hypothesis:

Rabbit grazing has no significant impact on the sucker recruitment of Acacia carnei.

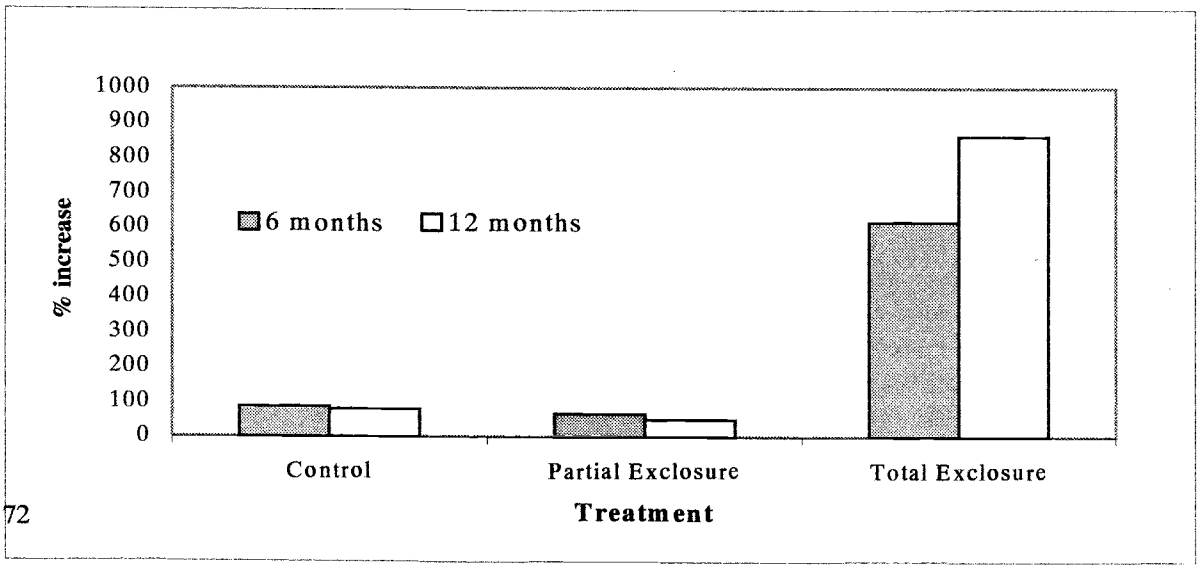
Percent increase in sucker recruitment was calculated for each treatment plot. The mean was calculated for each grazing treatment over the three repetitions at both six and twelve months. The subsequent grazing treatment data was then used to test the null hypothesis using analysis of variance.

3. Results

Figure 1 illustrates the observed differences between grazing treatments on sucker recruitment of *A. carnei* on Thackaringa Station. The illustration clearly shows the positive effect in sucker recruitment of the total exclosure in comparison to the partial exclosure and control grazing treatments.

No significant differences were found between grazing treatments at 6 months (P>10%). At 12 months, percent increase in sucker recruitment was significantly greater in the total exclosure treatment than both the partial exclosure and control grazing treatments (2.5%>P>1%).

Figure 1. Percent increase in sucker recruitment of *A. carnei* on Thackaringa in response to various grazing treatments.



4. Discussion

There were no juvenile plants present in the plots at start of project, those trees present were mature trees between 180 and 300 years old (Auld 1992).

While there has been an observed increase in suckers in the partial exclosures and control at Thackaringa, due to the drought, RCD and myxomatosis suppressing rabbit numbers, some suckers have survived in the control areas and partial exclosure. However, in many instances, different plants were counted from those counted six months previously. One would assume that as no suckers had survived between November 1995 and August 1998 then the suckers in the partial exclosure and controls will be grazed off in time unless they manage to reach a stage where, with maturity, the leaves become less palatable to the rabbits.

A good deal of difficulty was encountered eradicating the rabbits from the total exclosure at the Montana paddock site. After three initial treatments with a "Rid a Rabbit", a combination of methods were used to kill the remaining rabbits. No rabbits were observed when the fences were erected. However, evidence of their presence was observed. When those remaining in the total exclosure plots had their grazing range limited by the fencing, they were observed readily, some ten or more being shot or trapped. No more evidence of rabbits appeared after treating the exclosure with 1080 oats. This process took two months and in that time the rabbits did unprecedented damage as they became more stressed for food because of their limited grazing range. Of the 58 suckers that were counted in the initial count on 18 August 1998 at the Montana site all were nearly grazed back to ground level.

One of the amazing things that has been observed on Thackaringa is that since RCD swept through how little rain is needed to germinate and support the native plants. This observation has been supported by this project because the rainfall charts show there has been little rainfall combined with an intensely hot summer. Those in the community who are old enough to remember maintain that the current drought is equal to the great drought of 1940-44. They qualify that by saying the country is in much better heart because of the previously mentioned tools; polypipe, myxomatosis and RCD, and motor transport of livestock.

The total exclosure plot at the Cow Paddock site had a kangaroo visit for an unknown period. Quite a few juvenile plants showed signs of grazing at the time of the February count. This would have influenced the count and thus would explain the loss from 202 suckers on 9/2/99 to 181 on 31/8/99. It is not considered that a rabbit caused the damage as a close watch has been kept on the fence and we are confident that it has been maintained in a rabbit proof state at all times. There is however some stretching of the netting from the inside which is consistent with a kangaroo hitting it in an attempt to get out.

The partial exclosures at both the Quarry and Cow Paddock sites recorded low numbers of plants at all countings, not because of any bias or inconsistencies in the sites, but because it is apparent that there is slightly more rabbit activity in those areas even though at each site the control, partial exclosure and total exclosure, are all within approximately 100 metres of each other.

CONCLUSION

It has been clearly demonstrated that even at low numbers, rabbits are able to prevent successful recruitment of *A. carnei*. The implication is that rabbits would have a similar impact on the recruitment of Australian native flora in general. It adds support to Dr Brian Cooke's work that suggests that less than one rabbit per hectare is sufficient to prevent recruitment of species (Cooke 1991). Thackaringa has an average warren density of 0.47 warrens per hectare, before RCD there would be anything up to 50 or 60 rabbits living in a warren. With an estimated 26000 warrens on Thackaringa, even at post RCD levels, there is still limited opportunity for many species to recruit.

This paper also supports the contention that rabbits have been grossly underestimated in their effects on Australian flora and fauna and their impact has been masked by other issues such as a lack of understanding of a foreign environment by the first white landmanagers (Lord 1999). Further research and biodiversity studies are required to determine the level of impact rabbits are actually having on the Australian flora and fauna.

Most importantly, there is a need for a continued effort to reduce rabbit populations by other methods currently available, such as habitat destruction. There is also a need to continue to research new biological control agents. The current biological controls have provided an advantage in that they have substantially reduced rabbit numbers. This is a very rare opportunity and unfortunately it is not known how long this advantage will be available.

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