PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY BIENNIAL CONFERENCE
Official publication of The Australian Rangeland Society

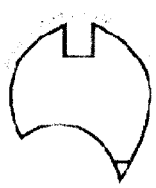
Form of Reference
The reference for this article should be in this general form;

Author family name, initials (year). Title. *In*: Proceedings of the *n*th Australian Rangeland Society Biennial Conference. Pages. (Australian Rangeland Society: Australia).

For example:

Anderson, L., van Klinken, R. D., and Shepherd, D. (2008). Aerially surveying Mesquite *(Prosopis* spp.) in the Pilbara. *In*: 'A Climate of Change in the Rangelands. Proceedings of the 15th Australian Rangeland Society Biennial Conference'. (Ed. D. Orr) 4 pages. (Australian Rangeland Society: Australia).

Disclaimer
The Australian Rangeland Society and Editors cannot be held responsible for errors or any consequences arising from the use of information obtained in this article or in the Proceedings of the Australian Rangeland Society Biennial Conferences. The views and opinions expressed do not necessarily reflect those of the Australian Rangeland Society and Editors, neither does the publication of advertisements constitute any endorsement by the Australian Rangeland Society and Editors of the products advertised.



The Australian Rangeland Society

Effects of artificial watering points on rangeland bird communities

Wilson, J.

Centre for Environmental Management, School of Science and Engineering, University of Ballarat, Mt Helen, VIC 3353, Australia

Keywords: Birds; water; assemblages

Abstract

Provision of permanent water in Australia's rangeland regions and the subsequent effects of grazing in these habitats have altered the composition and condition of arid zone bird communities. Some species have expanded their geographic range, mainly those that are water-dependent and benefit from disturbances. In contrast, certain species that are water-independent and are sensitive to disturbance have declined throughout much of their former range. Little is known about the direct causes for these declines or what factors are driving arid zone bird assemblages. This research investigates the effects of artificial watering points and other resources on bird assemblages in the southeast Australian rangelands. This research is being carried out at the University of Ballarats arid zone research property, "Nanya Station". Bird surveys and habitat assessments have been conducted at each of forty sites (ranging from 100 m to 6 km from AWPs) on the property to investigate relationships between birds and environmental variables. Contrary to expectation, preliminary results indicate that there is no relationship between distance to AWPs and bird assemblages. Further research will investigate whether other habitat variables (i.e. vegetation composition and/or structure) have an effect over the composition of rangeland avifauna.

Introduction

Arid regions throughout the world have been influenced by the introduction of artificial water

points (AWPs), impacting on species and ecosystems in diverse ways (see Weir 1971; James *et al*. 1999). Provision of AWPs to Australia's previously dry rangeland regions, primarily for the purpose of grazing domestic livestock on native vegetation, has had a profound effect on the composition and condition of flora and fauna in these environments (see review by James *et al*. 1999). Both introduced (i.e. cattle, sheep, goats, rabbits) and native herbivores (i.e. kangaroos) are drawn to the water points, particularly in the hottest times of the year, causing an increase in soil compaction and/or vegetation loss closer to the source of water (Valentine 1947). This is known as the 'piosphere effect' (Andrew 1988). These problems are widespread, given that throughout most regions of Australia water points are distributed less than 10 kilometres apart (Landsberg and Gillieson 1996).

There have been relatively few studies that have investigated the effects of AWPs and subsequent effects of grazing on rangeland bird communities. Research indicates that some bird species have responded positively to these disturbances having expanded their geographic range and increasing in abundance, whilst other species have disappeared from their former range (Reid and Fleming 1992). Species that usually benefit from these changes are those that are water-dependent and prefer disturbed habitats, whilst species that do not benefit or suffer from these changes are those that are water-independent and are habitat specialists (Williams and Wells 1986). Species that forage and/or nest on the ground represent the majority of birds that have declined around AWP's (Reid and Fleming 1992). Despite this, there is a general increase in the richness and abundance of birds around these points, which can be attributed to the increase in water dependent species (Harrington 2002).

This study investigates the effects of AWPs on the composition and structure of bird assemblages and how key habitat variables (e.g. litter, shrub cover) and the availability of resources (e.g. food, nesting sites) may be influencing community responses. This is a timely study given that land managers are seeking to close AWPs in an attempt to reduce the negative impacts of grazing on rangeland biodiversity. Insights from this work should provide sound science to underpin management decisions regarding the impacts of watering points on

biodiversity and ecological processes.

Methods

Study area

The study is being conducted at the University of Ballarats, arid zone research property, Nanya Station, a 40,000 ha property of mostly mallee-dominated woodlands, 150 kilometres northwest of Wentworth in south-western New South Wales (Fig.1). For many years, the property was managed as a pastoral lease. However, since the University purchased it in 2004, it has primarily been used as a research and teaching facility. The property contains around twenty ground tanks (or AWPs), from which sixteen are being used as part of experimental tank closure project, to gain greater insight into the effects of water point closure on rangeland biodiversity.

A total of forty sites (ranging from 100 m to 6 km from AWPs) were randomly chosen from mallee vegetation across the property.

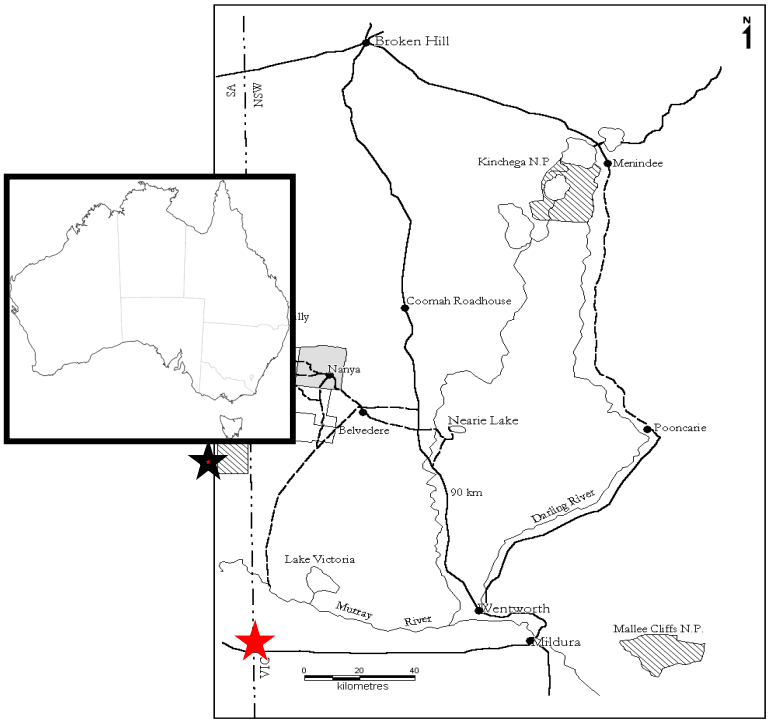


Fig.1. Study area indicated by red star at Nanya Station in south-western New South Wales, Australia.

Bird surveys

Morning and evening bird surveys are conducted at each site over 2 years and over 3 seasons, capturing the greatest amount of seasonal variability in arid zone bird communities. Surveys are conducted for 30 minutes along a 200 m (3 point) point transect. All birds that are seen or heard within a 50 m radius of each point are recorded. Birds detected outside the 50 m radius are recorded, however not included in the analyses.

Statistical analysis

Regression analysis was used to investigate the relationship of bird species richness and abundance with distance from water (distance as the continuous variable). Regression analyses

were also used to investigate the effect of distance to water on different feeding guilds as well as birds with differing dependencies on water, which had been identified in previous studies (Fisher *et al*. 1972; Harrington 2002).

Results

A total of 68 species and 1362 individuals were detected across all sites and surveys. Almost 50% of the birds detected were insectivores, whilst there were 25% granivores, 20% nectarivores, 5% carnivores and 5% omnivores (Table 1). All of the granivores, nectarvores and omnivores are dependent on water either in summer or all throughout the year. Only 9% of the insectivores and none of the carnivores detected were water-dependent. The majority of these species were either occasional drinkers or did not require water at all. Less than one-third of the birds detected throughout the study were water-dependent.

Table 1. Number of water-dependent and water-independent bird species in each feeding guild

Number of species								
	Water-dependent			Water-independent				
Guild	Y	S	Total	O	N	Total	Total Species	% water dependent
Insectivores	2	1	3	10	16	26	32	9
Carnivores	0	0	0	4	0	4	4	0
Granivores	6	2	8	0	0	0	16	100
Nectarvores	1	5	6	0	0	0	12	100
Omnivores	1	1	2	0	0	0	4	100
Total	10	9	19	14	16	30	68	28

Regression analyses showed that there were no significant relationships between distance to water and the richness and abundance of birds (R^2 <0.1). Similar results were found for each of the bird guilds and for birds of different water dependencies.

Discussion

Interestingly there was no relationship between water-dependency in birds and feeding guilds with distance to water. This may be explained by the fact that there was unusually high rainfall and more standing water across the landscape at the times the data was collected, which may have confounded the effect of distance to water in the analyses. Ongoing bird surveys over the next two years will help to determine how communities respond when water is more restricted across the landscape and provide stronger evidence for whether or not birds are influenced by AWP's at these distances. Further research will also investigate the role of other habitat variables and resources in driving arid zone bird communities.

Acknowledgements

I would like to thank the Lower Murray Darling Catchment Management Authority and the Department of Environment and Climate Change for funding this project. I would also like to thank my supervisors Professor Peter Gell, Dr. Fiona Christie and Dr. Simon Cook.

References

Andrew, M.H. (1988). Grazing impact in relation to livestock watering points. *TREE*, **3**, 336-339.

Fisher, C.D., Lindgren, E. & Dawson, W.R. (1972). Drinking Patterns and Behavior of Australian Desert Birds in Relation to Their Ecology and Abundance. *The Condor*, **74**, 111-136.

Harrington, R. (2002). The effects of artificial watering points on the distribution and abundance of avifauna in an arid and semi-arid mallee environment. *Unpublished PhD thesis, University of Melbourne*.

James, C.D., Landsberg, J. & Morton, S.R. (1999). Provision of watering points in the Australian arid zone: a review of effects on biota. *Journal of Arid Environments*, **41**, 87-121.

Landsberg, J. & Gillieson, D. (1996). Looking beyond the piospheres to locate biodiversity

reference areas in Australia's rangelands. *Rangelands in a Sustainable Biosphere-Proceedings of the Fifth International Rangeland Congress*. pp. 304–305.

Reid, J. & Fleming, M. (1992). The conservation status of birds in arid Australia. *Rangeland Journal*, **14**, 65–91.

Valentine, K.A. (1947). Distance from water as a factor in grazing capacity of rangeland. *Journal of Forestry*, **45**, 749–754.

Weir, J.S. (1971). The effect of creating additional water supplies in a central African National Park. In: Duffey, E. & Watt, A.S. (Eds), *The Scientific Management of Animal and Plant Communities for Conservation*, pp. 367-376. London: Blackwell Scientific. 652 pp.

Williams, S. & Wells, R.T. (1986). Providing water for native fauna in arid habitats. *Rangelands: a resource under seige-Proceedings of the Second International Rangelands Congress*. 558–559.

Wilson, J. (2010). Effects of artificial watering points on rangeland bird communities. In: *Proceedings of the 16th Biennial Conference of the Australian Rangeland Society*, Bourke (Eds D.J. Eldridge and C. Waters) (Australian Rangeland Society: Perth).