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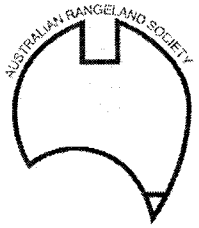

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A MODEL OF RECRUITMENT IN THE WESTERN MYALL (*ACACIA PAPYROCARPA* BENTH.): THE IMPORTANCE OF CO-OCCURRING EPISODIC EVENTS

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ABSTRACT

We propose an hypothesis model to account for the infrequency of recruitment (about once in 20 years) of western myall (*Acacia papyrocarpa* Benth.), an arid zone tree. In most years, ants effectively remove and destroy all western myall seeds. We propose that the successful establishment of myall seedlings requires the co-occurrence of the following: very heavy rainfall (for germination and establishment), scarification of hard seeds (by movement of sheet flow across the land surface) and shallow burial of seeds in soil and debris (to protect them from the harvester ants).

INTRODUCTION

The western myall (*Acacia papyrocarpa* Benth.) is the dominant tree species at Middleback station on the northern Eyre Peninsula, typical of the chenopod system of South Australia. It provides a productive basis for successful pastoral enterprise (Lange and Purdie, 1976). The species is a non-resprouter and thus reliant on regeneration from seed alone, but the combined effects of grazing by introduced and native herbivores usually suppresses the growth of seedlings (Lange and Graham, 1983; Lange and Purdie, 1976). However, new seedlings appear only rarely, about once in 20 years. What are the conditions necessary for seedling establishment?

METHODS AND RESULTS

A study of recruitment in the western myall (*Acacia papyrocarpa* Benth.) was undertaken during one seasonal cycle. During the period September 1991 to April 1992 a number of experiments were used to examine seed dispersal and predation, and dormancy and germination characteristics of the species.

Ants are the major removers of western myall seeds. Nearly all seeds in removal experiments were lost to ants or ant-like organisms (99%), rather than to vertebrates. *Pheidole* species ants remove most seeds within a few hours and are destructive seed predators, not benign seed dispersers; most seed is taken too far underground for recruitment to occur (Ireland, 1992).

A high percentage (70%) of artificially buried seeds exhibited innate dormancy, remaining viable for at least eight months. No western myalls recruited during the year from these seeds despite above average rainfall (Ireland, 1992).

DISCUSSION

We have integrated the foregoing into a model of western myall recruitment. This model has two conditions, one for normal years (such as the year of our study) and one for the abnormal years where the various episodic events coincide to produce substantial recruitment of the species. In **normal** years there is no recruitment to western myall populations because of sparse production of fruit, actions of pre-dispersal predators, almost total destruction of the seed by harvester ants and less than ideal climatic conditions. Given the long-term population dynamics of the western myall, this does not matter. In **abnormal** years large and intense rainfall events, occur as late summer thunderstorms. The successful establishment of western myall requires these rains to stimulate germination; sufficient follow-up rains to promote onward growth; and low herbivore (especially rabbit) density (Noble, 1986). We have refined Noble's model by adding the following features:

- late summer thunderstorms which coincide with seed fall,
- overland sheet flow of water caused by the rainfall, which scarifies the seeds, tumbling them along with gravel and debris, and buries them in safe sites (containing enough moisture and nutrients for germination and establishment, and protected by burial from seed harvester ants),
- maintenance of moisture levels by milder than usual summer temperatures and/or follow-up rain, and
- growth of ephemeral species which protects seedlings from herbivores.

Thus the occasional years that are important for recruitment are those in which there is a co-occurrence of rare episodic events, as described in our model. Experiments will be undertaken shortly to test our hypotheses about scarification due to sheet flow, and protection from ant predation by burial.

However, the fact remains that under the present grazing regime (rabbits and sheep) the onward growth of virtually all seedlings is suppressed. Managing these hazards remains a challenge.

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REFERENCES

Ireland, C. 1992. Recruitment in the Western Myall (*Acacia papyrocarpa* Benth.): flowering, formation and fate of seed and the regeneration niche. BSc Honours (Botany) Thesis, University of Adelaide.

Lange, R.T. and Graham, C.R. 1983. Rabbits and the failure of regeneration in Australian arid zone *Acacia*. *Aust. J. Ecol.* 8:377-381.

Lange, R.T. and Purdie, R. 1976. Western Myall (*Acacia sowdenii*), its survival prospects and management needs. *Aust. Rangel. J.* 1:64-69.

Noble I.R. 1986. The dynamics of range ecosystems. *In: A Rangelands: A Resource Under Siege*. (Eds P.J. Joss, P.W. Lynch and O.B. Williams). Australian Academy of Sciences, Canberra.