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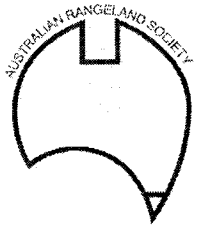

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GRAZING PRESSURE AND PASTURE DEGRADATION

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The grazing of domestic livestock has commonly led to decline in productivity and stability of rangeland pastures. Palatable perennial grasses decrease, ephemeral forbs increase, and inedible shrubs invade, lowering efficiency of animal prodcution. A severely degraded ecosystem is the extensive (1.6 M km^2) mulga woodlands (1). This poster paper reports the grazing pressure on perennial grasses in an eastern mulga woodland in relation to sheep density and the consequences of high grazing pressure for plant survival, seed production and recruitment.

METHODS

The study was conducted in a mulga (*Acacia aneura*) woodland at the CSIRO Lake Mere Research Facility (30° 16'S, 144° 54'E). Vegetation and landscape were typical of mulga woodlands (2) with three major vegetation zones associated with the patterned sequence of geomorphic zones in the landscape: woollybutt (*Eragrostis eriopoda*) grassland, bandicoot (*Monachather paradoxa*) grassland and mulga woodland in the runon areas. The 204 ha site was fenced to form 13 paddocks of different sizes. Each paddock encompassed the three vegetation zones. Seven paddocks were grazed by four or five merino wether sheep. Grazing commenced in November 1986 with densities ranging from 0.3 to 1 sheep/ha. Grazing pressure on mulga mitchell grass (*Thyridolepis mitchelliana*) was measured in two paddocks (0.33 and 0.67 sheep/ha) during three week periods in September 1987 and March 1988 as described elsewhere (3). Plant survival, recruitment and panicle production were determined at two to three monthly intervals in permanent 1 m^2 quadrats, randomly located within the vegetation zones in each paddock and in exclosures.

RESULTS AND DISCUSSION

The proportion of tillers grazed each week in the low sheep density paddock, was 0.2 in September 1987 and March 1988 when pasture on offer was 101 and 140 kg/ha respectively. In the high sheep density paddock the proportion of tillers grazed was 0.33 in September 1987, and 0.25 in March 1988. Pasture biomass on offer in this paddock was 26 and 49 kg/ha on the respective occassions. Within paddocks there was no statistically significant difference in tiller defoliation between the vegetation zones although there were 3 to 15 fold differences between zones in the pasture biomass on offer. Dung counts confirmed that sheep showed no preference for any zone at any sheep density, at this and other times during 1987. The relatively uniform grazing pressure across this variable landscape during drought conditions, suggest that pasture degradation is correlated with density of sheep and not with sheep preferences for certain vegetation zones, such as the less sparsely vegetated woollybutt grassland on ridges and slopes.

High sheep density for nearly two years however did not enhance the mortality of *T. mitchelliana*, nor other grass species, but in 1989 some grazing induced mortality occurred. This may be explained by: morphological adjustment under continuous close grazing, possible lowering of grazing pressure during autumn and winter 1988 with the abundant forb growth, and/or possible inherent resilience of plants under heavy grazing.

During the period end of December 1987 to the end of July 1988, above average rainfall (488 mm) induced perennial grass and ephemeral forb recruitment in all vegetation zones. Recruitment of *T. mitchelliana* was highest in the mulga woodland and groves, and in the bandicoot grassland (5.5 and 4.0 seedlings/m^2 respectively). It was lowest in the woollybutt grassland (0.9 seedlings/m^2), presumably because it was the most difficult environment for germination and establishment (lower infiltration, high radiation) and/or there was low availability of seed (fewer plants, seed loss in overland flow). Sheep density did not affect the level of recruitment of this species within any zone. *T. mitchelliana* seedlings often die after defoliation (4), hence they must not have been grazed in this study. Abundant pasture on offer and the protection afforded by larger plants would discourage grazing of seedlings.

Production of panicles throughout the 1988 autumn and winter was reduced by grazing in proportion to the density of sheep, reaching zero panicle production at 0.6 sheep/ha or higher. In exclosures panicle production was highest in the mulga woodland and groves, and lower but similar in the woollybutt and bandicoot grasslands. It is concluded that density reduction of this and other palatable perennial grasses through overgrazing occurs because of diminished seed production and the consequent lowering of recruitment to sub-critical levels, especially in the woollybutt zone where recruitment levels are normally low. Reduction in perennial grass cover in the woollybutt zone probably leads to increased runoff into mulga groves and woodlands, (1,2) thereby reducing the overall pasture productivity.

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