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Dion Nicol
Curtin University, Australia

J. E. D. Fox
Curtin University, Australia

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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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Ecology of herbaceous legumes in the Fortescue River valley floodplain , western Australia

D.L. Nicol and J.E.D. Fox

Mulga Research Centre , Curtin University , GPO Box 1987 Perth , WA , Australia . E-mail : dion.nicol@student.curtin.edu.au

Key words : population dynamics , herbaceous legumes , plant cover , floodplain , rainfall

Introduction In the Fortescue floodplain herbaceous legumes (HL) are mainly taxa of Papilionaceae (with one Mimosaceae) that fail to develop woody stems and branches . Historical data from Curtin University (MRC) studies suggest that vegetation condition is primarily dependent on the unpredictable (though seasonal) influence of cyclonic rainfall and consequential flooding (Fox *et al.* , 2006) . Biomass production is known to increase with the presence of legumes in both pastures and native ecosystems . Holm (*et al.* , 2002) suggests that productivity is more useful than diversity for determining the condition of arid ecosystems/pastures . Therefore , understanding the role of HL in the productivity of arid floodplains may enhance effective pastoral management .

Materials and methods Between 1992 and 1994 , 60 plots were established across the Fortescue floodplain to record information on vegetation dynamics . These plots were spread across Ethel Creek (22°53'56"S , 120° 01'19"E) , Roy Hill (22°37'18"S , 120° 55'23"E) and Marillana cattle stations (22°38'S , 119°24'E) . The mean annual rainfall (1907–2006) at Ethel Creek is 276 mm . The predominant vegetation types are Coolibah (*Eucalyptus victrix*) woodlands with a grassy understorey and open grasslands , both with cracking clay (vertisols) soils . Plant density and cover have been recorded since studies began in 1992 , at least bi-annually . In 2006 assessments were conducted in May (post summer) and August (winter) . Each plot is 20×25 m with angle iron pickets on each corner . The first transect (0-25 m) runs north-south along the eastern boundary . The second transect (26-50 m) runs parallel to transect 1 through the plot centre . Quadrats of 1×1 m are assessed sequentially . All live plants are identified with density (no . of stems in the m²) and estimated percentage cover is recorded . The mean cover (%) and density (stems/m²) are then calculated for each species within each plot .

Results Total biomass of the floodplain is highly correlated to available moisture with an extreme very low mean cover of all plots in April 2005 of <0.5% and ~65% cover by May 2006 (data not shown) . In total , some 21 taxa of HL have been recorded (1992-2006) . Herbaceous legumes have occurred at all 60 plots , but have not always been recorded at a particular assessment . Early in the study , herbaceous legumes were small contributors and grasses were mainly annual (Figure 1) . *Cullen cinereum* is the most important HL accounting for a mean proportion of 62.8% of total HL cover for 2006 .

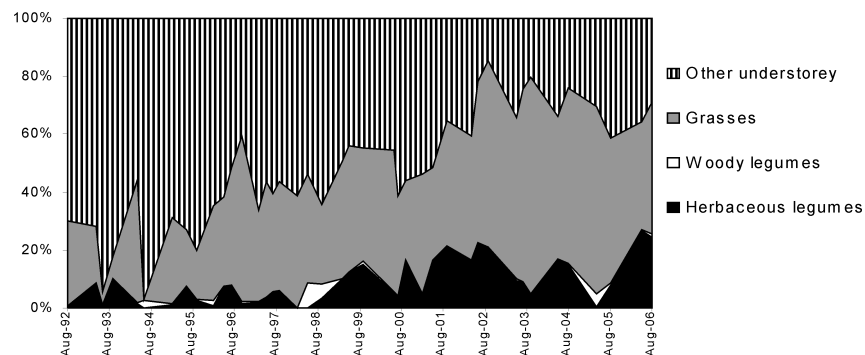


Figure 1 Proportion of understorey cover (%) from 1992-2006 of all plots assessed .

Conclusions Increased growth of legumes has followed regionally higher rainfall across the study period . Legume growth may also be contributing indirectly to an increase in grass biomass through nitrogen fixation and increased ground cover . This is assumed to be contributing to overall improved floodplain productivity . It may be concluded that the pasture condition of the Fortescue floodplain has generally improved through the duration of the study . Research into patterns of herbaceous legume growth would confirm if and how these species actively contribute to enhanced productivity .

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