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Patch selection by cattle can be quantified using satellite imagery and GPS in extensive , semi-arid savannas

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Key words : patch type , selective grazing , stocking rate

Introduction Patch selection by grazing animals is difficult to quantify , particularly in large , extensive paddocks like those in northern Australia . However , advances in high resolution satellite imagery now allow identification of patch types over an entire paddock which combined with GPS collars to capture positional data , can give an accurate and comprehensive picture of landscape use by cattle .

Material and methods The study was conducted on an established grazing trial near Charters Towers , northern Australia (O'Reagan *et al.* 2007) . Average rainfall is 650mm , and the vegetation is an open savanna) Thirteen patch types (Table 1) were identified at every 1m pixel across the site using IKONOS high resolution satellite images for Dec 2005 and Feb 2006 . Archival GPS collars were fitted to 6 cattle in each of two replicates of the heavy (HSR) and light (LSR) stocked treatments (paddock size : 100 ha) from c . January to March 2005 and positional data collected hourly . Data from the two animals with the most fixes per treatment was used in the analysis (GPS methodology follows Tomkins and O'Reagan 2007) . Animal activity was classified into a grazing or resting phase . Jacob's index of selectivity was used to determine patch type selection .

Table 1 Patch types and their proportion within each treatment .

Patch type	HSR%	LSR%
2P : Perennial , palatable and/or productive grasses	2.7	2.6
3P : Perennial palatable productive (3P) grasses <i>Bothriochloa spp</i>	14.6	29.4
An : Annual grasses	9.7	10.1
Ar : <i>Aristida spp</i> . , Unpalatable perennial wiregrass	11.3	8.3
Ba : Bare ground	5.4	2.2
Ch : <i>Chrysopogon fallax</i> : a , perennial palatable grass of low bulk	10.8	9.4
Car : <i>Carissa ovalata</i> -A spiny encroaching shrub	20.2	15.7
Eri : <i>Eriachne spp</i> , unpalatable , perennial grass ,	9.1	7.3
Eri/Het : <i>Eriachne</i> with moderate proportion of the 3P grass H . <i>contortus</i>	2.1	0.9
M An : Annuals on (?) clay mounds	4.7	4.0
M 3P : Low density of Bothriochloa and annuals on clay mounds	2	2.1
M Car : <i>Carissa</i> on stony/sally clay mounds	2.3	2.5

Results and discussion Animals in both the HSR and LSR selected for annual grass patches (Figure 1) , probably because of the high leaf quality of these patches in the wet season . Animals in both treatments avoided *Carissa* and bare ground for obvious reasons . Surprisingly , LSR animals selected *Eriachne* patches probably because of the availability of high quality forbs and legumes in inter-tussock spaces . LSR cattle are possibly selecting these species despite their low bulk , as they can easily and quickly meet their nutrient requirements due to the higher availability of 3P pasture in the LSR treatment .

Conclusions This study has shown that a combination of high resolution imagery and GPS collars can be used to quantify patch selection at a very fine resolution in large extensive paddocks .

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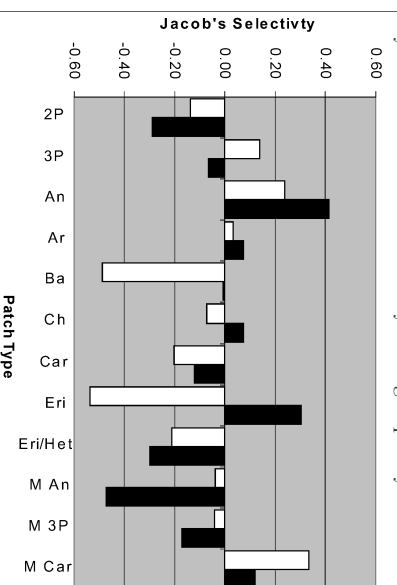


Figure 1 Jacob's selectivity index for different patch types under heavy (□) and light (■) stocking treatments .