ESTIMATION OF SHEEP STOCKING INTENSITY AT ANY LOCATION IN ARID ZONE PADDOCKS

In the South Australian arid zone, over 60 species of endangered native flora[1] are exposed to sheep grazing within the wire-fenced large enclosures called paddocks, which the pastoral industry has superimposed on approximately 220 000 km^2 of landscape. A problem for botanists who wish to evaluate the consequences to these endangered species, is how to estimate the sheep stocking intensities in each of those parts of paddocks where endangered species occur (Fig. 1). This note explains an approximate solution.

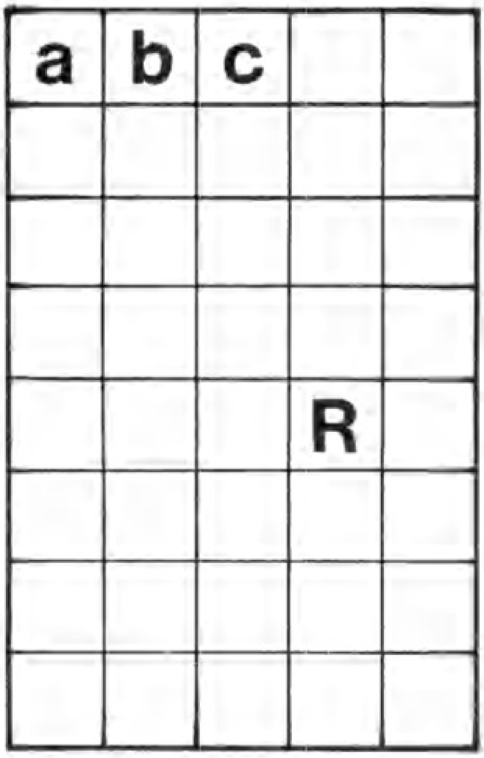

Fig. 1. Hypothetical large sheep paddock in the arid zone with endangered plants at R and the paddock considered to consist of n equal parts a, b, c -----.

Experiments in that region showed that 15–20 sheep roaming free in experimental paddocks of 2–4 ha exhibited the same behavioural cycle[3] as did flocks in adjoining large paddocks. The experimental sheep also tended to deposit egesta unequally on the various parts of their paddocks (divided into 14–30 parts) in proportion to the flocktime which they spent on them, provided accumulation periods exceeded 2 days.

In 3 experiments each in different years, regressions between egesta recovered from the parts (y Kg oven dry) versus sheeptime spent on the parts (x sheep minutes) were very highly significant. Lines of best fit in the 3 experiments were

$y = 0.19 + 0.0005x$, $r^2 = 0.92$, $n = 30$, $p < 0.001$ N.S.

$y = 0.19 + 0.0003x$, $r^2 = 0.96$, $n = 14$, $p < 0.001$ $p < 0.05$.

$y = 0.08 + 0.0006x$, $r^2 = 0.98$, $n = 17$, $p < 0.001$ N.S.

The data-set for the first of these equations is already published[3]; but that for the second is

y	1.050	1.323	.575	.644	.739	1.191	.622
x	1654	3695	649	843	1284	4132	858
y	.683	.610	2.004	1.126	1.000	1.300	3.826
x	952	1725	6591	2782	1471	4429	12230

and that for the third is

y	.135	.258	.249	.669	.176	.184	.416	.457	.354
x	115	547	192	561	176	158	586	422	370
y	.235	.406	.504	2.935	2.058	9.125	0	0	
x	436	965	980	3105	4.427	15552	0	216	

The marginally-significant intercept in one experiment (as if some egesta for no sheeptime) is considered to be an artifact; the two variables are in general directly proportional. Slope differences reflect differences in pasture condition between years. There is no impediment to the following argument, which requires only proportionality in the given case, regardless of slope.

In any part of adjoining large industrial paddocks, where endangered species occur, stocking intensity in that part (SIP) over a given period would be

$$\frac{\text{area of the part (ha)}}{\text{paddock flocksize} \times \text{fraction of total flocktime spent in the part } (F)} = \text{SIP (ha sheep}^{-1})$$

Substituting the relevant fraction of paddock total egesta deposition for F allows an approximate solution of the equation. The egesta fraction has to be obtained by sampling since industrial paddocks are too large (2000–20 000 ha) to permit total recoveries.

Applications indicate that at typical paddock stocking rates in the Whyalla region (6–7 ha sheep^{-1}), yearly SIP may vary from 0.5 ha sheep^{-1} or heavier, through all intermediate levels to 300 sheep^{-1} or lighter. The sheep grazing stress imposed upon endangered species varies accordingly. Detailed cases and their implications will be described later.

[1]**Leigh, J., Briggs, J. & Hartley, W.** (1981) W. Aust. Nat. Parks and Wildlife Serv. Spec. Pub. 7.

[2]**Moore, P. D.** (1976) Nature 262, 6-7.

[3]**Lange, R. T. & Willcocks, M. C.** (1979) Aust. J. Exp. Agric. An. Husb. 18, 764-767.

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