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STUDIES ON A FREE RANGING CATTLE HERD IN THE PILBARA REGION OF WESTERN AUSTRALIA

Changes in Breeding Herd Structure and the Effect of Vaccination with Botulinum C+D Vaccine over a Four Year Period

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Introduction

Records were kept of the free ranging cattle herd on Prairie Downs station. Prairie Downs is located approximately 70 km South of the town of Newman in the East Pilbara region of W.A. The area has an average annual rainfall of approximately 225 mm falling predominantly during the summer months.

The station is located across the divide between the Ashburton and Fortescue River basins and includes areas of rugged rocky hill terrain with steep sided creeks. Hill areas carry sparse annual grass cover (*Aristida contorta*) with scattered small shrubs (*Solanuj lasiophyllum*, *Ptilotus obovatus* and *Cassia spp*), under a stunted (*Acacia spp*) overstorey. Rugged hills nearer Newman often carry Spinifex (*Triodia spp*) and Bloodwood (*Eucalyptus spp*).

Where runoff is slower, alluvial flats, often with gilgiaed soils have developed. These carry a good cover of native annual and perennial grasses, (*Chloris spp*, *Panicum spp*, *Astrebla spp* and *Aristida contorta*). Occasional pockets of chenpod pastures can still be found carrying *Maireana pyramidata*, *Rhagodia spp* and *Atriplex paludosa*. These are generally isolated and often inaccessible except in high rainfall years.

When the investigation commenced in 1973 there were only ten waters, consequently areas around these mills are severely degraded. The halo effect of grazing often extending up to 2 km from the mill. The cattle were run on an open range principle and bulls were running with the herd continuously, no weaning was practised. One main muster was carried out each year in August-September. Other smaller musters to draft off sale cattle are carried out sporadically during the year. Most of the brandings were carried out at the main muster when an attempt to yard all cattle was made. This was the only muster attended by Departmental Staff.

Since 1973 three new windmills have been erected and one new holding paddock built. Unfortunately the extra mills did not alleviate stocking pressures on existing mills because of a dramatic increase in cattle numbers from 1973 - 1976. The holding paddock made cattle handling easier and contributed to the smooth running of subsequent musters.

Methods

Mustering

Two main yards were used during the muster, one at the homestead on the western end of the run and one on the eastern end of the run. The station was mustered in defined areas and the cattle from each area kept separate and returned to the same area. Waters were shut off the morning before an area was to be mustered and most cattle were picked up at the mills.

On the eastern end of the run, by far the most rugged, a light aircraft was used in conjunction with short wheel base landrovers and men on horseback. All were in two way radio contact. Cattle were mobbed up by the aircraft and landrovers and then driven back to the yards by the horsemen. Often drives as long as twenty kilometers were completed in one day.

On the western end of the run the light aircraft was not used and the less rugged terrain mustered using landrovers and horses.

The mustering techniques appeared to be satisfactory as long as there was no surface water and cattle were watering every day. Only in 1973 did the muster appear to be unsatisfactory.

Handling

At both yards in 1973 all animals were put through a bale and every animal tagged with a coloured and numbered, Lone Star brand, eartag. All calves branded each year were tagged with a specific colour and number range.

In subsequent years the animals were recorded, if present, by noting the colour and number of each animal's eartag as it passed through the bale. Other details, including condition, lactation status and stage of pregnancy were also recorded in some years, these will be the subject of future papers.

All even numbered cattle, including even numbered calves, present at each muster were vaccinated sub cutaneously with five mls of bivalent C+D Botulinum vaccine. An agrimatic automatic vaccinating gun was used. All odd numbered animals were left unvaccinated. By comparing the numbers of even and odd numbered cattle it was possible to examine the effect of vaccinating for prevention of Botulism.

Results

Herd Structure

Cattle mustered each year are shown in Table 1. These are divided into male and female for clarity. Some idea of the 'wastage' of animals can be seen through the years, however figures for the animals present do not give a true indication of actual wastage since many animals miss one year and then turn up in later years. The reduction of numbers from left to right across the table represents a combination of deaths, sales and mustering short fall.

The age structure of the breeder herd can be determined from the mustering records and shows a change towards a much younger herd during the course of the investigation (see Table 2). In this case and in Table 3 the vaccinated and non vaccinated animals have been lumped to form the one figure, since the age structure and survival patterns were similar for both vaccinated and non vaccinated animals.

As the age structure has changed during the course of the investigation so too have the survival patterns for groups of animals born in the same year. Table 3 highlights these changes but care must be taken when interpreting the changes from 1975 - 1976 as there has been no correction for cattle still alive but that missed the 1976 muster.

The male animals were not included in structure or age class survival diagrams as there were many sales that were not recorded and survival patterns would tend to give a false impression. Recorded sales for the four year period are shown in Table 5. This figure is lower than the actual numbers sold.

Vaccination with botulinum bivaleut C+D vaccine

Tables 4 and 5 show a breakdown of the effect of vaccination with the above vaccine into survival, sales, missing for the last one, two or three consecutive years. Using Chi square analyses, with the null hypothesis that vaccination would have no effect, then there was no significant effect from vaccinating in any way of the groups. The results showed non significance for both female (Table 4) and male (Table 5) animals.

Further breakdown of the survival data into the various age classes (Table 6 and 7) again revealed no significant difference in survival rates for male (Table 6) or female (Table 7) animals as a result of vaccination.

1972, the year prior to the commencement of the investigation, was very dry and feed very scarce. Heavy rains throughout 1973 led to abundant feed and plenty of surface water in that year. 1974 was a more 'average' year and abundant grass and herbage was available until late in the year. 1975 was another average year and fodder was still plentiful although animal condition suggested the feed quality was not as good as in the previous two years. 1976 was a drier year with feed available probably a limiting factor, particularly in the immediate vicinity of watering points.

Table 1 Showing wastage of animal numbers from figures present at each muster.

N.B. Sales have not been included as wastage but is included as present for the year in which the animal was sold

SEX	YEAR FIRST PRESENT	PRESENT 1973	PRESENT 1974	PRESENT 1975	PRESENT 1976
Male	1973	169	156	132	37
	1974		190	157	91
	1975			250	186
	1976				220
	Sub Total	169	346	539	534
Female	1973	476	395	370	307
	1974		251	216	181
	1975			267	178
	1976				275
	Sub Total	476	646	853	941
	TOTAL	645	992	1392	1475

TABLE 2. SHOWING THE AGE STRUCTURE OF THE BREEDERS IN EACH OF THE FOUR YEARS

N.B. Areas above solid black lines represent animals present but not mustered in the previous year.

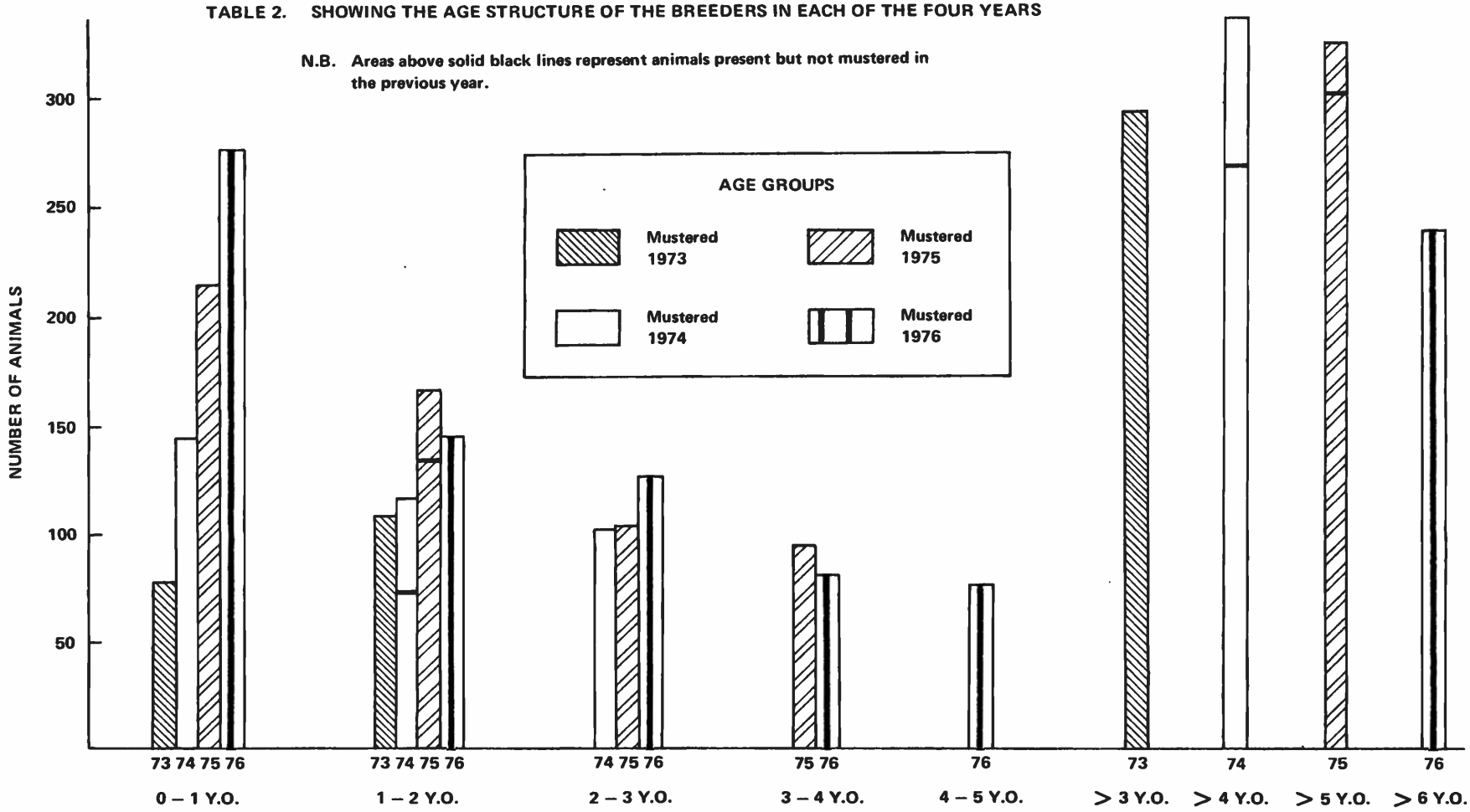

TABLE 3. SHOWING THE SURVIVAL OF FEMALE ANIMAL GROUPS THROUGH TIME

N.B. Areas above solid black lines represent animals present but not mustered in the previous year.

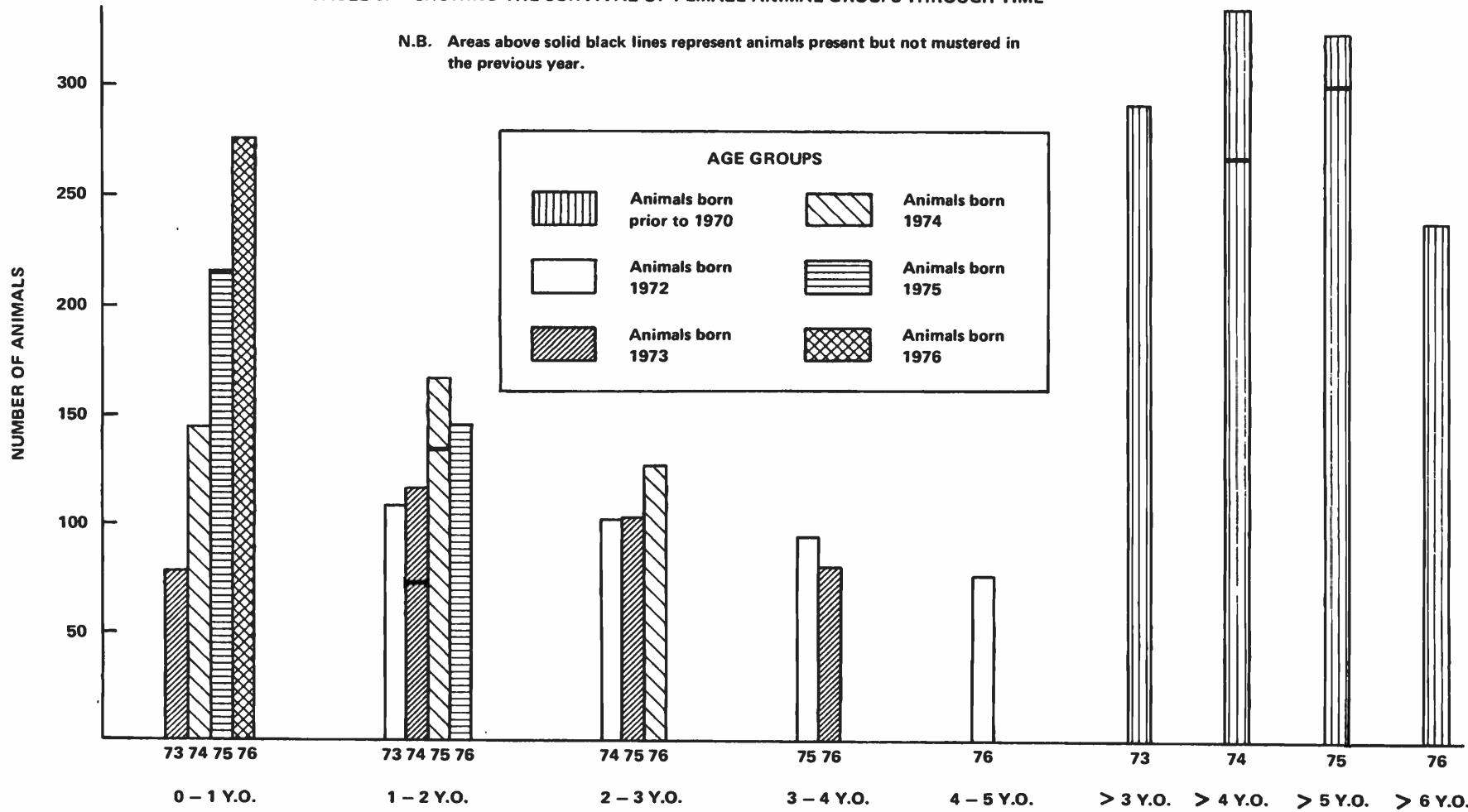

Table 4. Showing survival, sales and annual wastage of numbers of female cattle born in the various years.

AGE CLASS (Year Born)	SURVIVAL		SALES		MISSING LAST YEAR		MISSING LAST 2 YEARS		MISSING LAST 3 YEARS		TOTAL
	Vac.	N.Vac.	Vac.	N.Vac.	Vac.	N.Vac.	Vac.	N.Vac.	Vac.	N.Vac	
1970 or earlier	404	351	1	1	44	40	14	20	7	17	899
1972	128	119	-	-	10	7	1	7	3	3	278
1973	124	118	1	4	13	7	3	10	2	2	284
1974	132	126	1	1	23	14	1	8	-	-	306
1975	73	71	-	-	34	35	-	-	-	-	213
TOTAL	861	785	3	6	124	103	19	45	12	22	1980
X^2	2.1824 N.S.		0.9000 N.S.		2.3617 N.S.		7.3862 N.S.		2.0833 N.S.		

Table 5. Showing survival, sales and annual wastage of numbers of male cattle born in the various years.

AGE CLASS (Year Born)	SURVIVAL		SALES		MISSING LAST YEAR		MISSING LAST 2 YEARS		MISSING LAST 3 YEARS		TOTAL
	Vac.	N.Vac.	Vac.	N.Vac.	Vac.	N.Vac.	Vac.	N.Vac.	Vac.	N.Vac.	
1972 or earlier	57	63	7	13	16	15	11	5	12	14	213
1973	98	124	17	18	31	29	10	7	2	0	336
1974	92	85	4	4	14	25	8	6	-	-	238
1975	91	91	2	0	30	30	-	-	-	-	244
TOTAL	338	363	30	35	91	99	29	18	14	14	1034
X^2	1.8109 N.S.		1.9143 N.S.		1.6007 N.S.		1.5326 N.S.		1.0769 N.S.		

Table 6. Showing the numbers of male animals surviving 12 months after vaccination or non vaccination at various ages.

AGE	VAC.	N. VAC.
5 yo + >	5	10
4 yo + >	16	16
3 yo + >	36	30
2-3 yo	10	12
1-2 yo	67	74
0-1 yo	204	214
TOTAL	338	356

$X^2 = 1.4903$ N.S.

Table 7. Showing the number of female animals surviving 12 months after vaccination or non vaccination at various ages.

AGE	VAC.	N. VAC.
6 yo + >	9	7
5 yo + >	109	90
4 yo + >	147	125
3 yo + >	139	129
3-4 yo	35	33
2-3 yo	79	70
1-2 yo	163	160
0-1 yo	180	171
TOTAL	861	785

$X^2 = 2.5388$ N.S.

Rainfall records and comment on Pasture available

TABLE 8 ANNUAL RAINFALL (mm)

1972	1973	1974	1975	1976
95.4	448.4	216.8	284.0	227.0

Discussion

Herd Structure

The increase in cattle numbers from 645 - 1475 in the four years (1973 - 1976) was due to very high calving rates in 1974, 1975 and 1976 (67%, 93% and 91% respectively). Plentiful surface water in 1973 meant cattle were scattered and difficult to muster and the high mustering short fall increases the difference between 1973 and 1976 numbers. Sales were low for the four year period due to initial attempts to build up the herd numbers and later due to low cattle prices.

The high calving rates mentioned above are almost certainly due to the very high rainfall year in 1974 and subsequent 'average' seasons that have provided adequate forage to maintain calving rates at high levels.

There has been no active culling of the breeding herd and the influx of large numbers of young animals has effectively changed the age structure of the herd. In 1973 38% of the females were less than three years of age while in 1976 this had increased to 58%.

Survival patterns in groups of females of the same age were examined in an attempt to pin point areas of highest loss. From Table 3 these appear to be at weaning, during the first calving season and as old cows. These areas of loss do not necessarily all occur as high components of loss in every year. For example weaning losses were high in 1975 - 1976 but were not outstanding in other years. Losses at first calving were high in 1974 - 1975 and 1975 - 1976 and old cows only in 1975 - 1976.

Botulinum vaccination

Contrary to the situation in the wetter tropical areas of Western Australia, The Northern Territory and Queensland, botulism poisoning does not appear to be a significant cause of cattle deaths in the semi arid Pilbara region of Western Australia. During the four years of the investigation there was neither significant increase in survival or sales, nor significant decrease in cattle missing for the last one, two or three years as a result of vaccination. Both male and female animals showed non significant results.

It should be emphasised that there were no very dry years during the investigation and it may be that if cattle were subjected to severe nutritional stress they may be more susceptible to botulism.

Management Implications

Animal numbers can build up rapidly during good seasons and advantage should be taken of these build ups to increase sales in the form of cull females. It should be possible to upgrade the breeding herd by culling young females with undesirable traits and by culling old cows.

Animals should receive special care during weaning and first calving phases, perhaps paddocks should be erected on better pasture types for weaning. First calvers should be watched closely in an attempt to reduce losses.

Old cows (greater than 6 - 8 years old) should be sold as culls to reduce losses from cow death.

It is particularly important to have a fixed selling and culling programme and to meet the market prices for all classes of cattle rather than 'hang' on and thus overstock country that will provide future drought reserves. Some evidence of over-stocking can be seen in the 1975 - 1976 losses when overgrazing around mills was becoming particularly noticeable.

Vaccinating against Botulism would not appear warranted in the seasons experienced during the course of the investigation.

Conclusions

During a run of 'average' and 'above average' seasons reproductive rates are very high and herd numbers build up rapidly.

Weaners and first calvers require special management to avoid high losses, weaners requiring better pasture areas and first calvers more frequent observation.

Cows greater than 6 to 8 years old should be culled.

During periods of rapid herd build up young breeders should be culled to upgrade the herd.

Vaccination against botulism is not necessary in 'normal' seasons.