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Terminal sire comparisons of the Charolais and Murray Grey breeds for calving difficulty, calf survival and growth

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ABSTRACT

A trial at Tokanui and Templeton Research Stations was designed to compare the Charolais and Murray Grey breeds as terminal sires. There were calvings at both stations in 1980, and at Tokanui in 1981. Ten Murray Grey and 7 Charolais sires were used over crossbred cows to calve at 3 years or older in 1980, with the same cows in 1981, generating respectively 231 and 223 calves/breed. Sires were used in common across years and stations by artificial insemination, and reference sires were used to link earlier Charolais data. Of calves born, 1.7% sired by Murray Greys and 7.2% sired by Charolais bulls had birth difficulties; in total 3.5% and 7.6% of calves respectively died before weaning. Relative to Murray Grey-sired calves, birth weights of Charolais-sired calves were 8 kg (24%) higher; weaning weights at 4 to 5 months of age were 22 kg (13%) higher, with a similar percentage margin at 12 and 16 months. Weight of calf weaned per cow calving was 6% higher for Charolais-sired calves, making due allowance for different calf death losses and gestation lengths.

Keywords Beef cattle; breeds; growth; calving difficulty; calf survival; Charolais; Murray Grey

INTRODUCTION

Many extensive comparisons of beef breeds as terminal sires have been conducted in New Zealand and overseas (e.g., Baker and Carter, 1982; Gregory *et al.*, 1982), but no large study has included the Murray Grey under temperate conditions. Animal Breeding Abstracts (1971 to 1982) contains only 6 references to Murray Grey crosses. Two reports from a Queensland trial involved *Bos indicus* crosses not directly relevant to New Zealand conditions. The remaining 4 from temperate conditions included a commentary on a few imported cattle (Collins, 1972), a series of questionnaire replies in Australia concerning progeny of 1 Charolais bull (Stephenson and Gates, 1973) and 2 reports from an extensive British trial (Southgate *et al.*, 1982; Kempster *et al.*, 1982) containing large numbers of most breeds but only 15 Murray Grey-sired cattle.

In his dictionary of cattle breeds, Mason (1969) described the Murray Grey, which was developed in Australia, as 'silver-grey to grey-dun; polled; originated from 12 grey calves out of a light roan (nearly white) Shorthorn female by an Aberdeen-Angus bull born 1905 onwards; graded to Aberdeen-Angus and selected for grey (dun); Breed Society 1962, Herd Book 1965'. In view of this origin, it seems likely that the Murray Grey performance would be similar to Angus and Shorthorn, although its coat colour in crosses may be confused with Charolais crosses. It is surprising that no formal comparisons have been made in Australia, its country of origin. The Murray Grey was compared in this study with the Charolais as a terminal sire breed, in view of its relatively wide use in that role in New Zealand. This paper reports on calving ease, calf survival and growth.

MATERIALS AND METHODS

Experimental Design

Ten Murray Grey sires for use in the trial by artificial insemination (AI) were nominated by the Murray Grey Society of New Zealand (Inc.), and 7 AI Charolais sires were obtained either as nominated New Zealand Charolais Cattle Society bulls or as registered bulls available through commercial semen suppliers. Crossbred cows were used at Tokanui Research Station (Te Awamutu) to generate the experimental stock in the 1980 and 1981 calvings, and also at Templeton Research Station (Christchurch) in 1980. Cows were 3 years or older in 1980. Repeat sires were used to provide reference links between years at Tokanui and most bulls in the first year were used at both stations. Reference Charolais sires were also used to link the 1980 and 1981 calvings with a previous drop (1979) of Charolais-sired calves at Tokanui, and 3 of the Charolais sires had been used in Ruakura's beef breed evaluations over calvings from 1972 to 1977 (Baker and Carter, 1982). The present summary describes the results from the Murray Grey-sired and Charolais-sired calves born in 1980 and 1981, but the performance of the 7 Charolais sires is also given relative to the more numerous records of Charolais-sired calves born in 1972 to 1979. Seventeen of the overall 24 sires were linked via repeat-mated sires.

A total of 231 Murray Grey-sired and 223 Charolais-sired calves (subsequently referred to as Murray Grey and Charolais) were generated from 1980 and 1981 calvings, over both locations and years. Data at birth and 4-month weaning were available from both locations but later records were available only from Tokanui. Male calves were castrated at birth.

Data summarised in this paper are:

- Gestation length (d),
- Birth weight (kg),
- Calving difficulty score (CD): O = none or not seen, 1 = some difficulty
- Calf mortality, CM1 (perinatal, ⩽2 days)
  CM2 (preweaning, 3 days to weaning)
- Weaning weight (kg), 4 months
- May weight (kg), 8 months
- Yearling weight (kg), September
- January weight (kg), 16 months.

Statistical Analyses

Least squares were used to analyse the weight data (Harvey, 1977). The effects fitted in the basic model were: herd-year (3 values up to weaning, 2 thereafter), dam age (3, 4, ⩾5 year), sire breed of calf (Charolais or Murray Grey), dam breed (10 crossbred types and straight-bred Angus), calf sex (steer or heifer) and sire within sire breed (15 degrees of freedom up to weaning, 14 thereafter). Also in the above model, for all weights except weaning weight, linear regressions on birth day were fitted overall and within herd-year. For weaning weight, regressions were fitted for calf age. An additional model was then run for birth weight fitting a covariate for gestation length. Models with gestation length as a dependent trait were then analysed using either birth day or birth weight as covariates.

Sire breed effects were tested for significance against the mean square for sire-within-breed.

Another model with 1 extra main effect and 1 extra degree of freedom was also fitted for birth weight and gestation length, i.e., including an effect for calving difficulty or calf mortality. The breed effects (within herd-year) on calving difficulty and calf mortality were analysed by Chi-square.

RESULTS

Number of cows calving and calves recorded at various stages up to 16 months of age are given in Table 1. There were 4 twin sets each among Charolais and Murray Grey calves.

Birth Difficulty and Calf Mortality

There were 16 (7.2%) Charolais calves and 4 (1.7%) Murray Grey calves experiencing birth difficulties ($P<0.01$). The disparity between breeds was narrower for CM1 (Charolais 9/223 and Murray Grey 5/231, of calves born) and for CM2 (Charolais 8/214 and Murray Grey 3/226, of calves alive at 2 days) and neither difference between breeds was significant. Combining perinatal and pre-weaning mortality rates led to 17 (7.6%) Charolais deaths and 8 (3.5%) Murray Grey deaths ($P=0.05$).

Gestation Length

Table 2 indicates a longer gestation (by 3.7 d) in Charolais calves ($P<0.01$). Bull calves were carried longer than female calves by 1.2 d ($P<0.01$). The overall regression on birth day was 0.052 ± 0.016 d/d ($P<0.01$). The overall regression on birth weight, 0.31 ± 0.05 d/kg ($P<0.01$), showed that calves with longer gestations were heavier. The residual standard deviation (RSD) for gestation length was about 4 d. Gestation length was not significantly affected by the calving difficulty status of the calf, regardless of whether or not birth weight was fitted as a covariate.

TABLE 1 Sire, dam and calf numbers by sire breed, location and year.

		Born	Bulls[a] used	Cows calving[b]	Calves: Born	Difficult births	Died ⩽2d	Died 3d to weaning	Weaned[c]	Records to 16 mo.
Charolais	Tokanui	1980	3	81	83	8	3	4	76	166
	Tokanui	1981	4	102	104	5	4	4	96	
	Templeton	1980	3	36	36	3	2	0	34	
Murray Grey	Tokanui	1980	6	81	83	2	1	0	82	167
	Tokanui	1981	6	101	103	1	3	2	98	
	Templeton	1980	6	45	45	1	1	1	43	

[a] 7 different Charolais and 10 different Murray Grey bulls.
[b] Excludes 3 abortions.
[c] All but 1 calf analysed for weaning weight.

Calf mortality (CM1) was not significantly related to gestation length.

Birth Weight

Table 2 shows that Charolais sires increased calf birth weight by 8.1 kg (24.5%) relative to Murray Grey sires ($P<0.01$). All other factors tested, except regressions on birth day, were significant. In a second birth weight model, the regression on gestation length was 0.29 ± 0.05 kg/d ($P<0.01$). With 2 covariates fitted simultaneously, the regressions were 0.30 ± 0.05 kg/d of gestation length and 0.03 ± 0.02 kg/d calved later. There was a significant effect of calving difficulty status ($P<0.05$) on birth weight – those born with no difficulty being 2.1 kg lighter – but no significant effect of CM1. The RSD was 4.6 kg.

Weaning and Later Weights

Sire breed effects on weights at weaning, May, yearling and January were large and consistent, with the Charolais effect being +12.7%, +11.4%, +12.4% and +11.3% respectively above the Murray Grey at the 4 weights (Table 2).

For all live weights, sire-within-breed effects were larger in the Charolais than in the Murray Grey breed.

Bloat Incidence

In the second year at Tokanui Research Station, (June 1982), 11 rising yearling cattle died of bloat less than 24 hours after being returned to a legume pasture after weighing. All 192 cattle were run in 1 mob at that time. Five out of 11 were Charolais calves (with no sire-within-breed prevalence); 5 out of 11 were heifers; there were no significant dam-breed differences. At the June weighing, those which subsequently died of bloat had unadjusted weights 24 kg (10%) higher than those which did not although this was not a significant difference. After adjustment for fixed effects (sex, sire breed, etc), the difference was 9.6 kg (4%). Further work on bloat susceptibility of the survivors was conducted and will be reported subsequently.

DISCUSSION

Breed Differences

Breed differences were statistically significant for all traits reported except perinatal and preweaning mortality and bloat incidence. Weight gains over the 12 months from weaning to the following January averaged 230 kg for Charolais and 209 kg for Murray Grey, a margin of 10.2%. The full productivity comparison of the 2 breeds as terminal sires (tonnes of live weight/100 calves born) must allow for differences in calf mortality. Thus, for weaning weight adjusted for birth date, calves were 7.9% superior to Murray Grey calves, /100 calves born. For 16-month live weight similarly adjusted, Charolais calves were 6.6% superior. The 3.7 d longer gestation length of Charolais-calves would result in a weaning weight penalty of 4.0 kg (2.4%) for the commercial farmer using terminal sires and weaning on a given date, leaving a 5.5% net advantage in productivity at weaning. This assumes that the weaning weight regression on calf age (1.07 kg/d) is close to an appropriate adjustment.

The relative food costs of achieving breed differences in live weight or weight gain are not known. Carcass

TABLE 2 Least squares means and analyses of variance of gestation length (d) and weights (kg) at birth, weaning, May, yearling and January (16 mo), for Charolais- and Murray Grey-sired calves.

Effect	Gestation length	Weight at Birth	Weaning (4mo)	May (8mo)	Yrlng	Jan. (16mo)
Sire breed[a]						
Charolais (C)	286.9	41.1	190.3	228.0	320.0	420.5
Murray Grey (MG)	283.2	33.0	168.8	204.6	284.8	377.7
Sire within C	**	**	**	**	**	**
Sire within MG	ns	*	ns	ns	ns	ns
Dam breed	**	**	**	**	**	**
Age of dam	*	**	*	ns	ns	ns
Herd-year	ns	**	**	**	**	**
Sex	**	**	**	**	**	**
Regression on birth day	**	ns	**	**	**	**
Regression within herd-year	ns	ns	-	*	ns	ns
Residual SD	4.2	4.1	18.6	19.4	24.9	29.6
Residual d.f.	400	400	395	301	301	301
Overall reg. coefficient (d^{-1})	0.05	0.02	1.08[b]	−1.2	−1.1	−1.0

[a] All sire breed differences: $P<0.01$.
[b] This regression was on calf age, leading to opposite sign.

weight and carcass dissection data will be reported in a further paper.

Additional analyses showed that the 7 Charolais sires used in this trial did not differ significantly in birth and weaning weight of progeny from the level of all Charolais sires used for calvings in 1972 to 1979 (-0.7 ± 0.8 kg for birth weight, and $+5.5 \pm 3.6$ kg for weaning weight).

The weaning and 16-month (January) differences in live weight of about 12% between the Charolais-sired and Murray Grey-sired calves can be compared with a value of 14% reported for Charolais-cross *v* pure-bred Angus calves at 20 months (Baker and Carter, 1982). With an expected 7.7% heterosis for 20-month weight (R. L. Baker, A. H. Carter and C. A. Morris, pers. comm.), the Murray Grey breed effect must have been similar to (or slightly inferior to) the Angus sire effect. This is probably reasonable given the Murray Grey breed history (Mason, 1969).

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