FACTORS INFLUENCING THE INTERVAL FROM CALVING TO FIRST OESTRUS IN BEEF CATTLE ON NORTH ISLAND HILL COUNTRY

T. W. KNIGHT and G. B. NICOLL

Whatawhata Hill Country Research Station, Hamilton

SUMMARY

Factors affecting post-calving interval (PCI) in Friesian, Angus, Friesian × Jersey, Friesian × (Friesian × Jersey), and Friesian × Angus cows on North Island hill country were analysed for the years 1971 to 1973 and 1975. PCI was reduced in 2-year-old and mature cows (3 years and older) by 0.7 days and 0.4 days, respectively, for each day later the cow calved. The magnitude of this relationship varied among years but not among breeds. Two-year-old cows had a longer PCI than mature cows (90 days *vs* 63 days). Mature Angus cows had a longer PCI (89 days) than Friesian and Friesian crossbred cows (59 to 65 days) but, in the 2-year-olds, Angus cows had the shortest PCI (81 days *vs* 92 to 95 days). There were large variations in PCI among years (72 to 111 days for 2-year-olds and 57 to 71 days for mature cows) which could not be accounted for by either post-calving liveweight or calving date.

INTRODUCTION

For maximum profitability in a hill country beef breeding enterprise, all the cows should, commencing as 2-year-olds, calve once every 12 months and calving should be confined to a period of approximately 45 days. Since, with a gestation length of 280 days, there are only 85 days for the cow to return to oestrus and conceive, the interval from calving to first oestrus (*i.e.*, post-calving interval, PCI) can have a marked effect on the ability of a cow to calve every 12 months. Morris (1976) found in two herds of Angus cows that the interval between calvings was correlated with PCI ($r = 0.29$ herd 1, $r = 0.54$ herd 2).

A number of factors can influence PCI, including breed and age of the cows, pre- and post-calving nutrition, date of calving, and whether or not a cow is suckling a calf (Warnick, 1955; Wiltbank *et al.*, 1962; Casida *et al.*, 1968; Bosman and Harwin, 1969; Dunn *et al.*, 1969). There have been no reports on factors affecting PCI in beef cattle on New Zealand hill country apart from that of Morris (1976).

This paper presents information on factors affecting PCI in Friesian (F), Angus (A), F × Jersey (F × J), F ×

(F × J) and F × A cows at the Whatawhata Hill Country Research Station over the years 1971 to 1973 and 1975.

METHOD

Calving dates were recorded each day and post-calving liveweight measured within 48 hours of calving.

Post-calving oestrus was detected using bulls fitted with "Chinball" mating harnesses. The colour of the ink was changed every 14 days but the harnesses and mating marks were checked at least twice a week. The 196 to 252 days in which the cows and bulls were joined were divided into 14-day periods, and the date of first oestrus was recorded as the middle of the period in which the cows were first marked. Joinings in the years analysed consisted first of 42 to 98 days with teaser bulls, 56 to 98 days with either entire or teaser bulls depending on whether or not the cows were being artificially inseminated, followed by another 56 to 84 days with teaser bulls.

Over teasing, all the cows were grazed together with vasectomized F bulls. Over entire mating, F, F × J, F × (F× J), F × A and one-third of the A cows were single-sire mated with F bulls. Cows were randomly allocated to mating groups within age at calving and breed. The remaining A cows were randomly allocated to single-sire groups of A bulls within age at calving. The bull to cow ratio was a maximum of 3:100.

The age range of the cows was from 2 to 10 years but for most of the analysis 3-year and older cows have been pooled and called mature cows. There were no 2-year-old F× J cows represented.

Heifers were mated 2 to 3 weeks earlier than older cows and subsequently calved 2 to 3 weeks earlier. The data analysed include only cows that were joined by the bulls immediately after calving.

The effects of calving date and post-calving liveweight on PCI were determined by regression analysis calculated within breeds, age and year of calving. Because all age groups of cows were not present in each breed each year, interactions among breeds, ages and years of calving could not be calculated. Thus the effects of breed and year of calving on PCI were determined by least squares analyses separately for the 2-year-old and mature cows.

Adjustments in the analyses were made for the influence on PCI of whether or not the cows were included in an artificial insemination programme over fertile mating.

RESULTS

Date of calving had a major influence on PCI in all breeds of cows (Table 1) and all years (Table 2). Over all, there was a decrease ($P < 0.001$) in PCI of 0.5 days for every day later the cows calved. Two-year-old cows had a larger decrease in PCI for every day later they calved than mature cows (Table 1) but there was no effect of breed of cow. The decrease in PCI for every day later the cows calved varied among years (Table 2). The mean and range of calving dates among years are also presented in Table 2. Since the calving dates varied ($P < 0.01$) among breed and age of cows and years of calving all the subsequent results have been corrected for calving date.

TABLE 1: THE CHANGE IN PCI (days) FOR EACH DAY LATER THAT COWS CALVE

Breed	*2-year-old Cows*	*Mature Cows*
F	— 0.4NS	— 0.5***
F × J	—	— 0.3*
F × (F × J)	— 0.7**	— 0.3NS
F × A	— 0.8*	— 0.6**
A	— 0.6**	— 0.3**
Pooled within breeds	— 0.7**	— 0.4**

TABLE 2: VARIATION IN PCI WITH CALVING DATE FOR THE FOUR YEARS OF CALVING AND MEAN AND RANGE OF CALVING DATES

Year of Calving	*Change in PCI for Each Day Later Cows Calve (days)*	*Calving Date*	
		Mean	*Range*
1971	— 0.8**	Oct. 16	Sept. 22-Nov. 19
1972	— 0.3**	Sept. 9	Aug. 2-Nov. 3
1973	— 0.6**	Sept. 5	July 20-Nov. 1
1975	— 0.7**	Oct. 2	Sept. 7-Nov. 11

There was no effect on PCI of age of cow within the mature cows but the 2-year-old cows had a longer PCI than the mature cows (90 days *vs* 63 days) and this was consistent over all breeds. The mean calving date to which the PCI was adjusted was 10 days earlier for the 2-year-olds than the mature cows but this would account for only a small portion of the difference in PCI. The mature A cows had a longer PCI than the F × J, F × (F × J) and F × A with the PCI of the F being intermediate ($P < 0.05$) (Table 3). This contrasts with the 2-year-old cows where the A cows tend to have a shorter PCI than the F or F cross-breds.

TABLE 3: THE PCI IN 2-YEAR-OLD AND MATURE COWS ACCORDING TO BREED

Breed	2-year-old Cows No.	2-year-old Cows PCI (days)	Mature Cows No.	Mature Cows PCI (days)
F	31	92	171	65
F × J	—	—	93	61
F × (F × J)	31	92	43	59
F × A	38	95	41	62
A	26	81	315	69
Significance		NS		$P < 0.05$

There were large variations ($P < 0.01$) in PCI among years of calving for both 2-year-old and mature cows (Table 4). While the variation in PCI among years appeared to follow the variation in post-calving liveweight, correction for this factor by covariate analysis only marginally reduced the variation in PCI. The PCI was reduced by 2.9 days ($P < 0.01$) and 0.6 days ($P < 0.01$) for every 10 kg increase in post-calving liveweight for the 2-year-old and mature cows, respectively. When date of calving was included as a covariate, the effect of post-calving liveweight on PCI was reduced to a decrease of 1.6 days for every 10 kg increase in post-calving liveweight for the 2-year-olds but there was no difference for the mature cows.

The residual standard deviation of PCI after adjusting for age, breed, year of calving, type of mating, date of calving and post-calving liveweight was ± 33 days and ± 22 days for the 2-year-old and mature cows, respectively.

TABLE 4: THE PCI AND POST-CALVING LIVEWEIGHT IN 2-YEAR-OLD AND MATURE COWS ACCORDING TO YEAR OF CALVING

Year of Calving	2-year-old Cows No.	2-year-old Cows PCI (days)	2-year-old Cows Weight (kg)	Mature Cows No.	Mature Cows PCI (days)	Mature Cows Weight (kg)
1971	11	111	283	89	65	388
1972	50	80	334	259	61	406
1973	49	97	323	204	71	389
1975	16	72	339	111	57	427
Significance		$P < 0.01$			$P < 0.01$	

DISCUSSION

The large reduction in PCI for every day later in the year the cows calve, especially for 2-year-olds, indicates that a change to calving later in the year could markedly reduce PCI. Attempts to offset the longer PCI of 2-year-olds by calving them earlier in

the year are largely negated by this negative relationship between calving date and PCI. Similar effects of calving date on PCI have been found in New Zealand by Morris (1976) for Angus cows (PCI decreased by 1.1 days for every day later cows calved), and by Dalton, Jury, Everitt and Hall (unpublished) for Friesian, Friesian × Herefords, Friesian × Simmental and Angus cows (PCI decreased by 0.8 days for every day later cows calved). The latter workers also found no differences in this relationship among breeds of cows. Warnick (1955) and Bosman and Harwin (1969) found a similar negative relationship between date of calving and PCI for range cows calving in late winter and spring but when calving occurred in autumn the calving date was positively related to PCI (Laster *et al.*, 1973).

The influence of calving date on PCI is probably due to the effect of increasing day length on pituitary gonadotrophin secretion (Warnick, 1955) and/or the improved pre- and post-calving nutrition in the later calving cows (Wiltbank *et al.*, 1962; Dunn *et al.*, 1969). The relatively large effect of post-calving liveweight on PCI in the 2-year-old cows and its reduction when calving date is included as a covariate suggest that pre-calving nutrition may account for some of the effect of calving date on PCI in the 2-year-old cows. In the mature cows post-calving liveweight had only a small effect on PCI.

It is generally considered that dairy cows have a shorter PCI than beef cows. However, most of the comparisons have been made among trials where the dairy cows were being milked and the beef cows suckled. Suckling has been shown to prolong PCI (Casida *et al.*, 1968). The present results indicate that even under the same conditions mature Friesian and Friesian crossbred cows have shorter PCI than Angus cows. This situation is reversed for the 2-year-old cows, presumably because of the greater milk production of the Friesians and Friesian crosses relative to Angus 2-year-olds. Over all, the 2-year-old cows had a longer PCI than the mature cows in all breeds but the differences were less marked in the Angus cows. Other studies have shown that 2-year-old cows have longer PCI than older cows (Bosman and Harwin, 1969; Wiltbank, 1970).

Despite adjustments for post-calving liveweight, differences in PCI among years were still apparent. Assuming that post-calving liveweight reflects pre-calving nutritional status, the persistence of differences in PCI among years suggests that post-calving nutrition may have an important effect on PCI. Other factors not included in the analysis are also likely to be involved since

the residual standard deviation was ± 33 days and ± 22 days for 2-year-old and mature cows, respectively.

In conclusion, this study shows that for beef cattle on hill country there must be a balance between calving early to gain maximum calf growth over spring and calving later to reduce the PCI. There is little advantage in mating yearling heifers earlier in order to have the 2-year-old cows mating at the same time as older cows. Preferential pre- and post-calving treatment may have to be given to 2-year-old cows to reduce their long PCI. This especially applies if the herd includes Friesian and Friesian-cross cows.

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