

GENETIC AND ENVIRONMENTAL FACTORS AFFECTING
CALVING DIFFICULTY IN POLISH LOWLAND CATTLE

Factores genéticos y ambientales que influyen sobre la frecuencia de aparición de casos difíciles de partos en el ganado Polaco de tierras bajas

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Introduction

Calving performance as an important element of profitable cattle breeding has in recent years received considerable attention. Several surveys of dairy and dual-purpose breeds have shown a high frequency of difficult births in heifers, ranging from 3% to 19%, and a lower occurrence in cows, between 1% to 8% (Philipsson 1976, Smidt and Huth 1979, Thompson et al. 1980).

The genetic model of dystocia is the same as the model for fetal effects (Van Vleck 1978).

The estimates of heritabilities of calving performance considered as a trait of the dam, or a trait of the calf were usually low. However, the existing genetic variability of this character justifies the evaluation of sires for calving ease (Philipsson et al. 1979).

In Polish dual-purpose Lowland cattle there is little information on incidence of dystocia and the estimates of genetic parameters are not available. The purpose of this preliminary study was to provide such estimates.

Material and Methods

Calving reports were collected in Pedigree Herds between 1977 and 1980. A total of 16,999 questionnaires included cow identification, breeding records, calving performance, stillbirth, cow age and calf weight. After all edits and restricting data to single-born calves and sires having at least 5 daughters, 11,760 records of both Black-White and Red-White breeds were analysed (Table 1). The numbers were slightly different for the analysis of dystocia, as a trait of the dam or as a trait of the calf.

The calving performance was divided into five categories: 1. Unassisted, 2. Assisted, 3. Difficult calving, veterinary assistance, 4. Very difficult calving (embryotomy), 5. Caesarean section. For the purpose of the present preliminary analysis, categories 3, 4, and 5 were pooled together.

The following linear model was used to describe the dystocia score:

$$Y_{ijkl} = \mu + S_i + HYS_j + C_k + b_1(X_{1ijkl} - \bar{x}_1) + b_2(X_{2ijkl} - \bar{x}_2) + e_{ijkl}$$

where Y_{ijkl} is the observed difficulty score, μ is the underlying population mean, S_i is the effect of the i th sire, HYS_j is the effect of the j th season of calving (October through March and April through September), C_k is the k th sex of calf, b_1 is the partial regression coefficient on the calf weight, X_{1ijkl}

is the birth weight of the calf of the $ijkl$ th cow, \bar{x}_1 is the mean birth weight of calves, b_2 is the partial regression coefficient on the cow age, X_{2ijkl} is the age of the $ijkl$ th cow, \bar{x}_2 is the mean age of cows, e_{ijkl} is the random residual component. All effects were considered fixed except the sire and residual effect. For estimating the cow effect, maternal grandsires of calves were S_i . Service sires (sires of calves) were substituted when analyzing the calf effects. In later calvings the regression on cow age was replaced by the parity effect.

Results and Discussion

The incidence of difficult calvings in Black-White and Red-White heifers was 9.4% and 12.3%, respectively. In mature cows the frequency was lower -4.5% in the Black-White breed and 6.6% in the Red-White breed. The higher occurrence of difficult calvings in heifers and in heavier Red-White breed is also reflected by the mean score (scoring on a 1 to 3 basis). The mean scores were 1.81 in Black-White heifers, 1.84 in Red-White heifers, 2.03 in Red-White cows, and 1.96 in Black-White cows. Direct comparison with other reports is practically impossible because of different definitions of calving categories and scoring systems; however, the general pattern of dystocia frequency is similar to that found by other authors.

In general the heritabilities of the calf effects were higher than those obtained for the cow effects. This is in agreement with reports of Bar Anan (1975) and Cady (1980). Different results were given by Brinks et al. (1973) who used the same method of analysis as applied in this preliminary study. The heritabilities were higher in the Red-White breed, 0.195 in heifers and 0.185 in cows. These results are close to the upper limit of the range of estimates found in the literature (Philipsson 1976, 1979). The corresponding heritabilities for the cow effects were 0.142 and 0.041, respectively. In the Black-White breed the heritability of cow effects was 0.051 in heifers and 0.015 in cows. The heritability of the calf effects was slightly smaller in heifers 0.067, compared to 0.090 in cows.

The fixed environmental effects included in the models (i.e., sex of calf, herd-year-season of calving) were in most cases significant. In heifers the regression on age at calving was not significant. The regression on calf weight was significant in all analyses, both in first and later calvings. In cows the effect of parity was significant.

TABLE 1. Characteristics of data and dystocia parameters. Sire of the dam effect.

	Black-White		Red-White	
	<u>First calving</u>	<u>Later calvings</u>	<u>First calving</u>	<u>Later calvings</u>
No. of calvings	2,211	6,478	615	2,063
No. of HYS	52	57	16	16
No. of sires	136	200	41	52
Mean score	1.96	1.81	2.03	1.84
SD	.48	.48	.46	.51
Heritability	.051	.015	.142	.041
SE	.039	.015	.094	.029

TABLE 1. Sire of calf effect.

	Black-White		Red-White	
	First calving	Later calvings	First calving	Later calvings
No. of calvings	2,265	6,721	632	2,142
No. of HYS	51	57	15	16
No. of sires	84	119	29	46
Mean score	1.96	1.80	2.05	1.84
SD	.46	.46	.46	.51
Heritability	.067	.090	.195	.185
SE	.036	.020	.098	.052

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Summary

The incidence of difficult calvings in Black-White and Red-White heifers was 9.4% and 12.3%, respectively. In cows the frequency of dystocia was 4.5% in the Black-White breed and 6.6% in the Red-White breed. The heritability of calf effect was higher than that obtained for the cow effect. The highest heritability was found for the calf effect in the Red-White breed, 0.195 in heifers and 0.185 in cows. The same heritability in the Black-White breed was 0.067 and 0.090, respectively. Lower heritabilities were estimated for the cow effect in both breeds. The fixed effects such as sex, herd-year-season at calving and parity significantly affected dystocia.

Resumen

Difíciles partos se dieron en las novillas de la raza regroblanca con una frecuencia de 9.4% y en las novillas de raza rojo-blanca con una frecuencia de 12.3%.

En las vacas la frecuencia alcanzó respectivamente 4.5% y 6.6%. La heredabilidad de los efectos directos (influencia del Ternero) fué mayor que las influencias maternas.

La mayor heredabilidad para los efectos directos en la raza 'rojo-blanca fué de: 0.195 en las novillas y 0.185 en las vacas. Estas mismas heredabilidades en el ganado negro-blanco fueron respectivamente 0.067 y 0.090.

Menores heredabilidades fueron estimadas para los efectos directos maternos en ambas razas.

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