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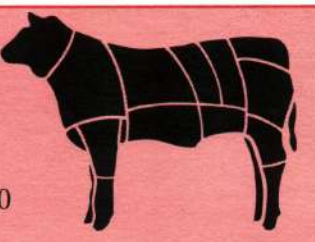

Pelvic Measurements and Calving Difficulty in Beef Cattle

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Dystocia

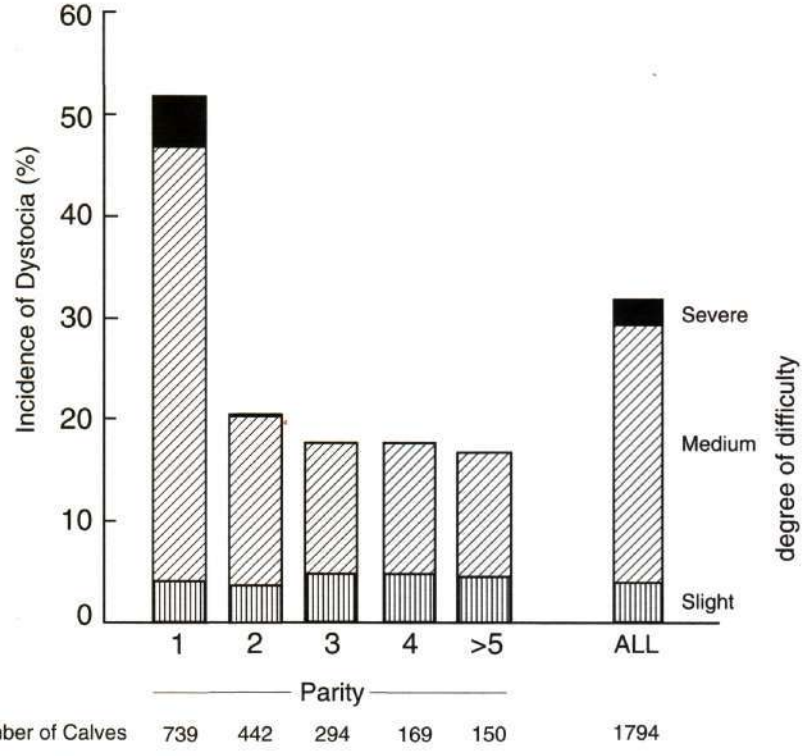
One of the most serious problems facing cow-calf producers is dystocia. Dystocia is defined as any birth requiring the assistance of a qualified attendant. The economic impacts of dystocia on the beef industry are high. Although impossible to evaluate precisely, annual losses can easily be estimated at between $500 million and $750 million. These losses can be attributed to several factors. First, a high percentage of all calf deaths are a result of dystocia. Montana studies show that 57 percent of all calf death losses are attributable to dystocia. Poor calf performance must be considered in conjunction with calf death losses. Calves born during dystocia have lower weaning weights and are more susceptible to disease. Research shows that approximately 50 percent of all first calf heifers experience some form of dystocia (Figure1).

The economic losses resulting from dystocia are not confined to calves. Not only can severe dystocia result in cow death, but a variety of reproductive and health problems are directly associated with cows experiencing dystocia. In particular, dystocia is related to an increase in the post-partum interval (days to first estrus), an increase in days open, a decrease in overall conception rate, a decrease in milk production, an increase in retained placentas and an increase in metritis and other uterine problems.

A variety of factors contribute to both the cause and severity of dystocia. The relative degree to which any one of these factors contribute to dystocia is often mediated by other factors. These often complex relationships make dystocia a particularly difficult problem to analyze and eliminate. Factors that contribute to dystocia are: large sire, undernourished and thin dam, abnormal presentation, first- and second-parity dam, male calves, and disproportionate size between calf and the maternal birth canal. Calf size can be measured in skeletal dimensions, which are difficult to accurately obtain, or by calf birth weight. Although not indicative of calf shape, calf birth weights are often a routine part of newborn calf processing. Maternal birth canal size can be estimated by measuring the cow's pelvic area (PA).

Research has shown that the three major contributing factors to dystocia are parity of dam, calf birth weight and maternal PA. First- and second-calf heifers, having not yet reached physical maturity, are particularly at risk. The effects of dystocia in these heifers can be greatly reduced by waiting to calve them at two and a half to three years of age. This practice, however, often results in a decrease in lifetime production that can never be recovered.

Figure 1. Percent and Degree of Dystocia by Parity (Adapted from Sieber et al., 1989)



Adapted from Sieber et al.

Calving at two years of age increases the effects of large birth weight calves because 2-year-old heifers have not reached skeletal maturity, as measured by PA.

Using low birth weight bulls can help reduce the effects of dystocia. This practice has its limitations, however. Research and data from sire summaries show that not only do calves sired by extremely small birth weight bulls have lower growth rates, but the resulting replacement heifers also tend to be more likely to experience dystocia. Nevertheless, using low birth weight sires on virgin heifers and first parity dams can be a valuable tool against dystocia.

Relationship of Pelvic Area to Dystocia

Recent studies have suggested that the use of pelvic measurements can help reduce the incidence and severity of dystocia. An Oklahoma study showed that heifers with small PA experienced an 85 percent dystocia rate, compared to a 31-percent dystocia rate for heifers with a large PA. Pelvic size itself is variable between and within breeds and types of cattle. In general, larger cattle tend to have larger PAs. However, since bigger cows tend to have bigger calves, selection for larger cattle is not an effective way to eliminate dystocia. The variability within a size category can, however, be significant.

Research data from Nebraska and South Dakota have been used to develop a means of predicting dystocia due to the disproportionate size between calf and pelvic opening. A factor representing the PA to calf birth weight ratio can predict the degree of difficulty a heifer is likely to experience (Table 1). Another way to use this calving ease factor involves calculating the size of calf a heifer can have unassisted. Dividing the prebreeding (12-13 mo.) PA by factors ranging from 2.0 to 2.5 can help predict the size of calf the heifer can have. Table 2 gives some sample calculations and possible culling decisions.

PA can be taken at any time in a heifer's life as long as she is physically large enough for rectal palpation to be practical. The recommended time is prebreeding (12-14 mo.). Data collected at this time can be used to predict potentially severe dystocia problems and eliminate these females from the breeding herd. In systems where a prebreeding exam is not feasible, PA can be obtained during the pregnancy exam. PA collected at this time (18-19 mo.) must be divided by factors ranging from 2.6 to 2.9 in order to provide an accurate prediction of dystocia. As more research analyzing the relationship of PA to dystocia is

Table 1. Pelvic Area/Calf Birth Weight Ratios For Various Weights and Ages To Estimate Deliverable Calf Birth Weights (Deutscher, 1991).

Heifer body	Age at measurement (months)			
weight (lb)	8-9	12-13	18-19	22-23
500	1.7	2.0	--	--
600	1.8	2.1	--	--
700	1.9	2.2	2.6	--
800	--	2.3	2.7	3.1
900	--	2.4	2.8	3.2
1000	--	2.5	2.9	3.3
1100	--	--	--	3.4

Table 2. Examples of Using Pelvic Measurements To Estimate Deliverable Calf Size.

Heifer age (mo)	Heifer wt. (lb)	Pelvic area (cm)	P/A BW ratio	Estimated calf BW	Management decision
12-13	600	140	2.1	67	cull
"	700	140	2.2	64	cull
"	"	160	2.2	73	close keep
"	"	180	2.2	82	easy keep
"	900	160	2.4	67	cull
"	"	200	2.4	83	easy keep
"	1000	180	2.5	72	close keep
"	"	220	2.5	88	easy keep

conducted, more accurate methods of utilizing PA will be developed.

Because many producers have replacement heifer groups with widely varying ages, an age adjustment factor is useful. Research indicates that the average pelvic growth rate is .27 square centimeters per day for heifers between one and two years of age.

When measuring bull PA, be aware that PA for a bull of a given age is less than PA for a heifer of a given age.

PA is related to age and to weight independently. This should be considered when using PA as a selection criterion for bulls raised in different management systems. Specifically, pelvic width (PW) is the later maturing dimension associated with PA. As such PW is more highly influenced by nutritional level. Consequently, bulls on a high plane of nutrition will have larger PA than bulls on a restricted diet. An adjustment factor of .09 square centimeters per lb. of body weight for bulls between 10 and 15 months old is recommended by the Beef Improvement Federation. The adjustment factor for age is .25 square centimeters per day. It must be noted that the weight adjustment factor should not be used in conjunction with the age adjustment factor and vice versa. PAs are routinely provided by many seedstock producers and in many performance tested bull sales.

Table 3. Estimates of Pelvic Area Heritability

Researchers	Heritability
Benyshek & Little (1982)	.53
Holzer & Scholte (1984)	.36
Bolze (1985)	.51 .71
Morrison et al. (1986)	.68
Nelson et al. (1986)	.92
Green et al. (1988)	.99
Average =	.61

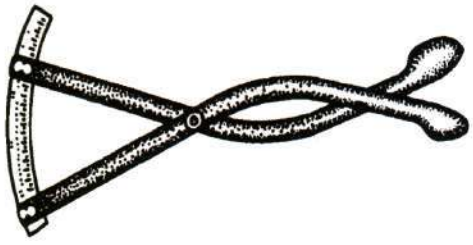
PA Heritability

Heritability estimates for PA are listed in Table 3. Since they are consistently moderate to high, selection of bulls and heifers with large pelvic areas will result in an increase in PA in the herd.

Measuring the Pelvis

Two basic types of instruments are used to measure the pelvis (Figure 2). Both are designed for rectal palpation use. The Rice Pelvimeter is a scissors type calipher. The Krautman-Litton bovine pelvimeter is a hydraulic cylinder connected to a

Figure 2. Pelvic Area Measuring Instruments



Rice Pelvimeter

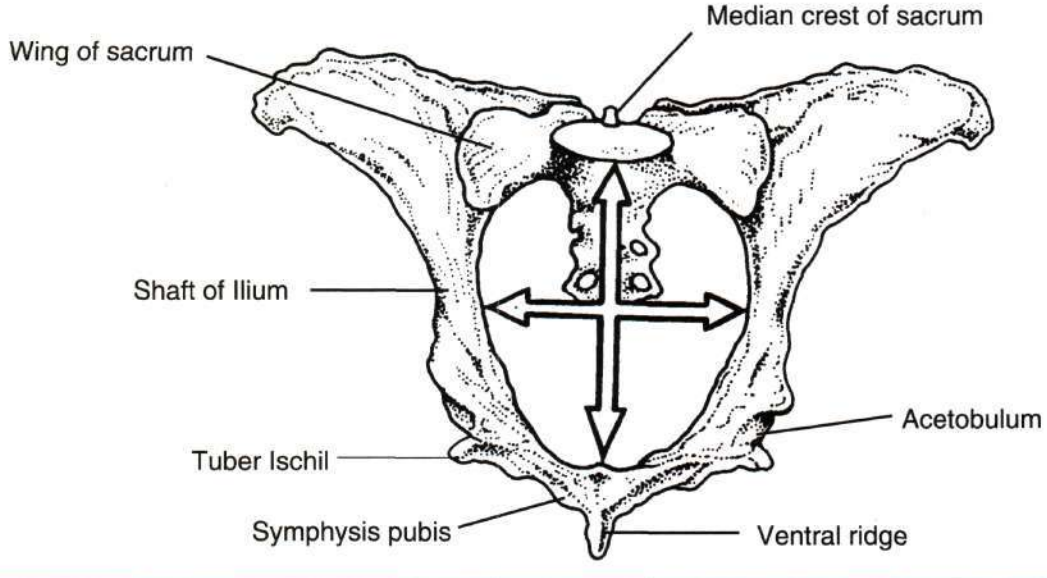
Krautman-Litton Pelvic Meter

hydraulic meter with a flexible hose. With practice, producers will be able to get accurate results using either instrument.

Figure 3 shows where measurements should be taken.

Pelvic height (PH) should be taken between the sacrum (spinal column) and the dorsal pubic tubercle on the floor of the pelvis. These anatomical structures can easily be located via rectal palpation. PW should be taken at the widest point between the illeal shafts (sides) of the pelvis. Although not precise, PA is calculated as a simple product of PH x PW.

Figure 3. Measurement Sites for Pelvic Area



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