



By the Numbers

► by **Sally Northcutt**, director of genetic research, American Angus Association

Birth weight EPDs and calving ease EPDs

Genetic tools for reducing difficult births in first-calf heifers have been readily embraced by the beef cattle industry. Angus breeders are very familiar with birth weight expected progeny differences (EPDs) and more recently have begun to use calving ease EPDs. It's not uncommon to be asked to review the definitions, units for the traits and their relationship.

Birth weight EPDs

Birth weight EPD is the traditional genetic tool, expressed in pounds (lb.), and is an indicator trait of calving ease in heifers. A lower numerical value for the EPD is considered favorable, although each producer must establish the reasonable range for birth weight EPDs in his or her heifer matings.

An example of birth weight EPDs on two sires is given in Fig. 1. On the average, the future calves out of Sire A are expected to be 5 lb. lighter at birth than the calves by Sire B. If both bulls were mated to comparable females and exposed to the same environmental conditions, the average birth weight difference between the two sets of calves is expected to be 5 lb.

Birth weight is a linear trait and is normally distributed. Fig. 2 illustrates that

both sires will leave a distribution of calves varying in birth weight. The normal distribution is why we may see a heavy-birth-weight calf born to low-birth-weight parents, and vice versa. Both sires may have calves weighing the same amount, as illustrated by the area where the two curves overlap, but on the average the difference is 5 lb.

Calving ease EPDs

While birth weight is the indicator trait, calving ease is the true trait of interest to breeders. Using birth weight EPDs is a good indirect measurement of calving ease. However, we know there are examples of the low-birth-weight-EPD bull that is harder-calving than expected and the higher-birth-EPD bull that consistently produces calves

born unassisted to first-calf heifers. The large database of calving scores at the American Angus Association allows more of a direct prediction of calving ease.

The calving ease EPDs are designed to improve the probability or chance of unassisted births in first-calf heifers. Calving ease EPDs are presented in units of percent unassisted births and appear as Calving Ease Direct (CED) and Calving Ease Maternal (CEM) EPDs. The CED EPD is most closely associated with the traditional birth weight EPD.

CED. CED EPDs between Sire A and Sire B predict the average difference in percent unassisted births to be 7%, favoring Sire A (Fig. 3, page 99). A more practical way to view the difference would be as follows.

The difference between the CED EPDs for the two sires equals seven. If you bred Sire A and Sire B each to 100 heifers, then you would expect seven more unassisted calves (CE score = 1) out of the 100 born to Sire A when compared to the 100 born to Sire B.

With calving ease EPDs, a higher value is more favorable since the units are percentage unassisted births. This tool can be used to select sires for use on heifers to improve the chance of easier calving through unassisted births. Since calving ease is a threshold trait, if there is no difficulty in heifers calving in a particular herd, then this percentage difference in unassisted births will not be realized or measurable.

CEM. Along a similar line, the CEM EPD is a genetic tool for use in choosing sires for replacement heifers. The CEM EPDs are designed to improve the percentage unassisted births in first-calf daughters of sires. A higher value is more favorable.

Analysis details

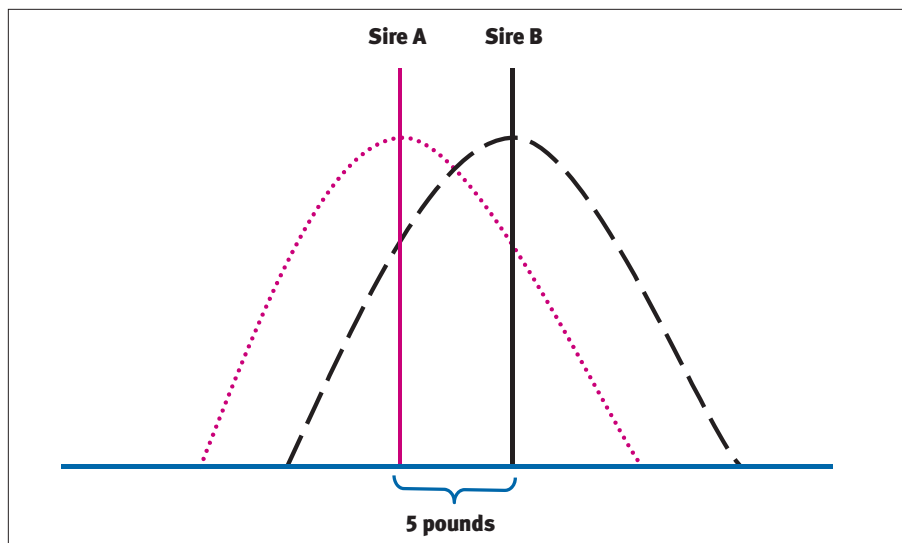
Additional explanation of the calving ease analysis can be found at www.angus.org/sireeval/ced_cem_web.pdf. If you prefer to skip the details, here are a few points to keep in mind. These bulleted items are answers to many of the commonly asked questions regarding calculation of calving ease EPDs.

- Birth weight is the indicator trait. Calving ease is the true trait of interest.

Fig. 1: Birth weight EPD example

BW EPD, lb.	Sire A +0	Sire B +5
The expected difference in the average birthweights of progeny of Sire A and Sire B is 5 lb.		

Fig. 2: Expected distribution in progeny birth weight.



- ▶ Calving ease EPDs are designed as a genetic tool directed toward heifers. The incidence of calving difficulty among cows is very low, and heifers are the primary focus.
- ▶ Birth weights on all calves from the Angus Herd Improvement Records (AHIRSM) database and calving scores on just the first-calf heifers are used in the genetic evaluation.
- ▶ Calves with heavier birth weights tend to be associated with potentially higher calving score values (1 = unassisted, 4 = C-section).
- ▶ Abnormal presentations are excluded from the evaluation.
- ▶ The genetic correlation between birth weight and calving scores is high (+0.76). However, since the genetic correlation is not equal to 1.0, the relationship is not perfect.
- ▶ Interim CED and CEM EPDs are pedigree estimates only (accuracy is 0.05). The birth weight EPD may be more informative in

this case, so review the associated accuracies.

- ▶ Bulls with more favorable CED EPDs tend to have favorable CEM EPDs also, although the relationship is not perfect. CED and CEM EPDs have a positive genetic correlation (+0.42).


What does it all mean?

Producers need to understand and evaluate both birth weight EPDs and calving ease EPDs to develop a comfort level in the

Fig. 3: Calving ease direct EPD example

Calving ease direct (CED)	
Sire A	+10%
Sire B	+3%
Difference	+7%
<ul style="list-style-type: none"> ▶ Higher EPDs are more favorable. ▶ Use as a tool in choosing sires mated to first-calf heifers. ▶ Increase the chance of easier calving. 	

genetic selection for their herd. Birth weight EPDs have served the Angus breed well to identify genetics to reduce calving difficulty, but the calving ease EPDs now allow a further refinement of that selection. Remember that calving ease is still the real trait we are trying to measure and calving ease EPDs will continue to be more widely accepted by the commercial user of Angus genetics.



E-MAIL: snorthcutt@angus.org

Editor's Note: "By the Numbers" is a column by Association performance programs staff to share insights with Angus members about data collection and interpretation, the National Cattle Evaluation (NCE), genetic selection, and relevant technology and industry issues. If you have questions or would like to suggest a topic for a future column, contact Sally Northcutt, director of genetic research, or Bill Bowman, director of performance programs, at (816) 383-5100.