By the Numbers

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

It's a cow's life

One of the American Angus Association's research initiatives is to characterize reproduction in the Angus breed. It's perhaps the most difficult class of traits to face in terms of creating genetic values. That is not to downplay the importance of these traits. Seedstock and commercial producers continually ask about the availability of reproductive selection tools to use in their herds. A large database for research would enhance the ability to develop genetic predictions, such as expected progeny differences (EPDs) and indexes, for the reproductive complex.

Heritability

Heritability estimates for reproductive traits tend to be low, indicating that selection for these traits is more difficult. As a general rule of thumb, the following are typical ranges for heritability estimates from beef cattle literature. There are exceptions in each category of traits, but these ranges generally describe the portion of the variation of the trait that is due to genetics, the rest being due to environment.

Reproduction	(low)	<0.20
Growth	(moderate)	0.20-0.40
Carcass	(high)	>0.40

Calving interval, for example, would have a heritability of about 0.10, or 10% of the variation being genetic. In contrast to reproductive traits, carcass traits are more highly heritable, indicating that selection can be effective for these traits. Environment and management easily influence reproductive traits, so a large database becomes very attractive in better defining and analyzing the cow's breeding performance and longevity in the herd.

Database development

The Association's reproductive database is in its infancy, compared with where we want to be in years to come. This information will be used in future reproductive trait research, for traits such as heifer pregnancy and cow longevity initially.

Fig. 1: AAA Login: breeding data entry page

Fig. 2: AAA Login: disposal and reason codes

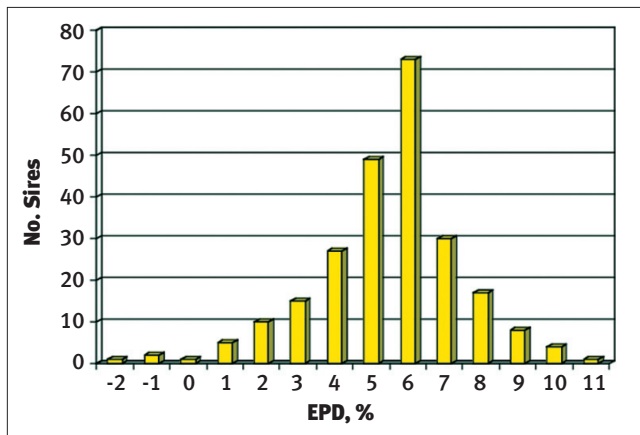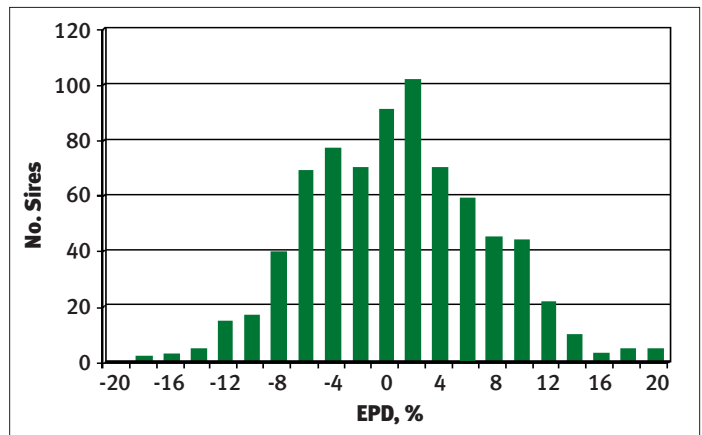**Fig. 3: Distribution of Angus heifer pregnancy EPDs, %**

Fig. 4: Distribution of Angus stayability EPDs, %

Progress toward multi-trait reproductive genetic tools could stem from this effort. First, a more comprehensive database is necessary.

The goal of a reproductive database is to fully describe the event in each cow's reproductive herd life. From the start, her breeding records, contemporaries, breeding dates, service sires, artificial insemination (AI) and pasture details, along with outcomes and calf performance through her last production day in the herd are tracked. Fig. 1 illustrates the breeding data entry screen currently available in AAA Login. Data entry fields include these items, with specifics such as synchronization and disposal/reason codes (see Fig. 2).

Traits of interest

A breed database for reproductive performance would allow research in the areas of heifer pregnancy, days to calving, first AI success and longevity. Currently, research for heifer pregnancy and stayability is under way.

Heifer pregnancy. The heritability estimate for pregnancy in Angus heifers, as estimated by Minick et al. at Iowa State University, was 0.13. These research data, along with data available from the Association's database, were used t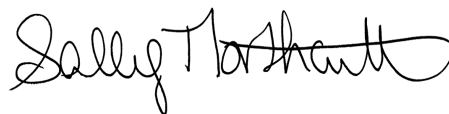o generate EPDs on 243 Angus sires. Fig. 3 depicts the distribution of heifer pregnancy EPDs in units of percent, where a higher value is more favorable. This EPD could be used as a genetic selection tool in evaluating percentage difference in daughter pregnancy among sires.

Stayability. The heritability for stayability as a measure of cow longevity is similar in magnitude to that of heifer pregnancy. The classic definition of stayability, as used by some breeds already publishing stayability EPDs, is the probability that a cow will remain in the herd until she is 6 years of age. These EPDs are typically reported in percentage, with a higher value being more favorable. Fig. 4 illustrates the distribution of stayability EPDs in Angus females, based on a test dataset of 274,541 records.

In this example, a set of 743 sires from the main sire listing in the *Sire Evaluation Report* had stayability EPDs ranging from -18% to +23%. A stayability to 3 years of age, rather than 6 years of age, was computed in a similar fashion. The "stayability 3 EPDs" were strongly correlated with "stayability 6 EPDs." An EPD for stayability or longevity in some form would identify genetic differences among future daughters of sires for the ability of these females to remain in the cow herd.

What to expect

Expect to see the evolution of how breeders view performance as we work toward capturing breeding records for an Angus female. The life of the Angus cow will begin when she is a first-calf heifer exposed with her contemporaries for breeding. This data-recording of AI and natural service breedings will be followed by calf success and calfhood performance. The database will result in genetic prediction tools, such as EPDs, used separately or potentially in concert with each other. The new "boxes" of EPDs potentially may add to your list, but their economic relevance makes it all worthwhile.

Sally Northcutt

E-MAIL: snorthcutt@angus.org