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Production advantages through superior genetics

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Speculation on the way to genetic improvement in deer is a popular topic of discussion among deer farmers, game ranchers and wildlife managers worldwide. However, there will be a diversity of approaches depending on the specific situation. The appropriate pathway depends on the objective. Therefore as with any animal breeding enterprise, defining the objective of the breeding programme is the first critical step.

The second critical step is the definition and choice of options. However with deer, this step is subtly different from other animal breeding enterprises. This is particularly so with the Cervinae or "Old World Deer". Among this group of deer, many of the different types will hybridise with each other producing fertile hybrids as offspring. Among these families there is an enormous diversity of size and other characteristics such as antler shape. This provides the opportunity to interbreed different strains, subspecies or species of deer in order to produce new types of deer with improved productive characteristics. As well as hybridisation between different deer types, there is also the opportunity for selection within a strain.

The third step is recording the performance of your deer. This involves clarifying the purpose of recording and consequently comes back to defining the objective.

Objectives

Setting the objectives is the fundamental first step in a genetic improvement programme. In this process there are a number of questions such as:

- How do you want to get the returns on your investment in deer (venison, velvet antler, selling stags or breeding hinds)?
- How much input do you want to put into the operation?
- How big do you want your animals?
- Do you want to produce your own breeding stags or do you want to buy them?

Defining the objective will establish where you are coming from and ensuring that you know the direction in which you are aiming.

Options

Hybridisation

The Cervinae are an extraordinary group of deer. They exhibit an amazing capacity to hybridise successfully with species or subspecies which are apparently distantly related and appear to be quite different. There are three good examples, the red deer family being the most remarkable.

Among the red deer family, the small sika deer will hybridise with both red deer, which themselves cover a very wide size range, and wapiti. The members of this family will also hybridise with a distant relation, the Père David's deer. This is extraordinary considering the fact that these two species are apparently a very long way apart genetically. For example, the Père David's deer is a summer breeder and the red deer is an autumn breeder, and the Père David's deer has a gestation length of about 50 days longer than the red deer. Wapiti and red deer will also interbreed readily, although the former has a gestation length of about 20 days longer. The red deer from mainland Europe (Germany, Hungary and Yugoslavia) are genetically markedly larger than the red deer of Scotland, yet there appears to be little difference in gestation length.

Also among the Cervinae, European fallow and the larger Mesopotamian fallow deer will successfully hybridise. Among the tropical Cervinae, the larger sambar will hybridise with the rusa deer, while both the Javan and Moloccan rusa will also hybridise. It is this widespread extraordinary capacity for hybridisation which provides the deer breeder

with numerous choices in addition to the traditional approach of selection within a strain.

Selection

Selection within a strain is relatively straightforward. It involves selecting the top stags for breeding coupled with culling of hinds on performance and selection of young replacement hinds on the basis of their genetic background and their performance (e.g. live weight) at the time of selection. The major difficulty with this approach is the lack of basic genetic information on which to base one's decisions. However, the small amount of data actually available indicates that important traits like weaning weight, yearling weight and fertility are all highly heritable. Consequently good progress can be made in breeding based on selection for these traits. Similarly in stags, the data indicate that body weight and antler size are highly heritable. However, there is a lack of information on the genetic relationships between traits. For example, this is important when it comes to considering the impact of selection for body weight on antler size, although there is a well known positive relationship between the two (in fact antler weight tends to increase at a relatively faster rate than does body weight).

Decisions

The decision whether to go for hybridisation between strains or selection within a strain is a complex one. Often, the appropriate approach may be a combination of the two. For example with the New Zealand situation, the female breeding herd may be a smaller strain of red deer with the stags being wapiti x red deer hybrids or the larger strains of European red deer. The female progeny could be slaughtered or sold to a farmer who prefers larger hinds. The males could be slaughtered and/or selected to form the basis of a velveting herd.

Sound decisions depend on information. Therefore a definition of the likely effect of the different approaches is necessary. While the available data are still limited at this stage, some assessments have been made. For the red deer family, data for the expected yearling weights for the progeny of various sire types over base New Zealand red hinds are presented in Table 1. At this stage, the European and the Père David information is based on few records, but the wapiti data are more soundly based.

In the few years before hybridisation was a real option for New Zealand deer farmers, breeders used within strain selection to improve the performance of their herds. They selected their breeding stags on the basis of body size and antler size, and often mated their largest hinds to the top stags in an attempt to breed even better stags. They made real progress, but with the hybridisation option, progress can be faster. This is mainly because there is more scope with hybridisation because of the variation between strains or species.

Table 1 - hybridisation: Relative yearling liveweights for the progeny of stags of various strains/species over New Zealand red deer hinds (CW, Canadian wapiti; PD, Père David's deer):

Sire	Progeny	Relative liveweight
NZ Red (NZR)	NZR	100
German red	½ German/ ½ NZR	120
Hungarian red	½ Hungarian/ ½ NZR	120
½ PD/½ NZR	¼ PD/¾ NZR	120
½ CW/½ NZR	¼ CW/¾ NZR	122
CW	½ CW/½ NZR	140

Recording

Recording is the third critical step. Whatever option is chosen, the aim is to know how your animals are performing and who are the top performers. In terms of pedigree, knowing the sire is very important. Knowing the dam can also be useful. For hinds we suggest recording weaning weight, 15 month weight, and an annual weight (usually in winter) thereafter. Whether the hind rears a calf is also an important consideration. For stags, we recommend the same weighing times as well as antler measurements.

Summary

There are three key considerations in making genetic progress. They are establishing the objectives of your venture, choosing the options for genetic improvement and recording the appropriate information.

References

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