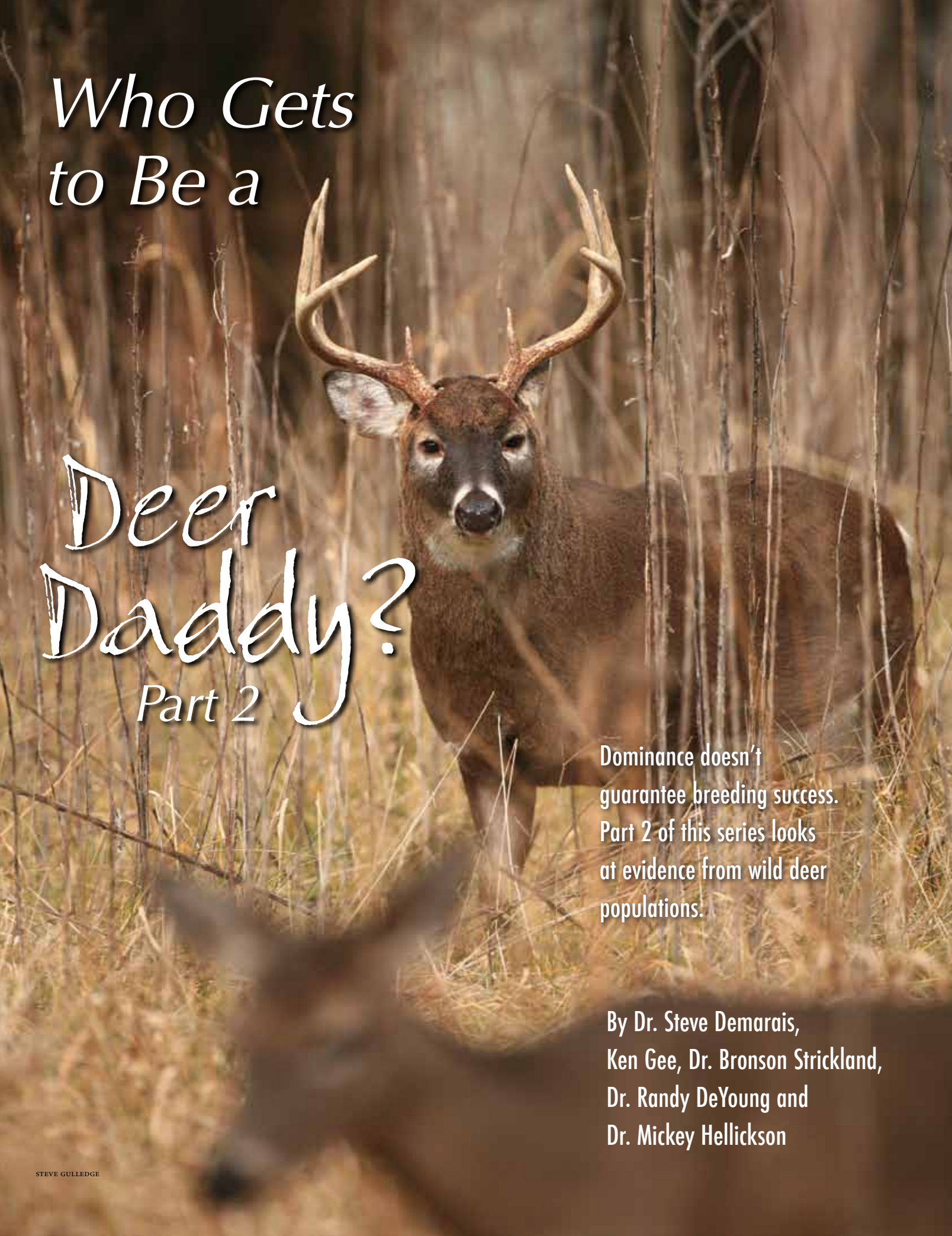
Who Gets to Be a Deer Daddy? Part 2



Dominance doesn't guarantee breeding success. Part 2 of this series looks at evidence from wild deer populations.

By Dr. Steve Demarais, Ken Gee, Dr. Bronson Strickland, Dr. Randy DeYoung and Dr. Mickey Hellickson

STEVE GULLEDGE

In the last issue of *Quality Whitetails*, in the first part of this article series, we addressed commonly held assumptions about how certain characteristics – age, body weight and antler size – determine social dominance among adult bucks. We also addressed the assumption that dominance leads to breeding success.

At the Mississippi State University Deer Lab, we have conducted a series of studies designed to reveal the degree of truth behind many long-held assumptions about deer breeding behavior. In studies done in captivity, we found that social dominance didn't always rely as closely on age as had previously been thought. And, body weight also wasn't the "tell all" factor.

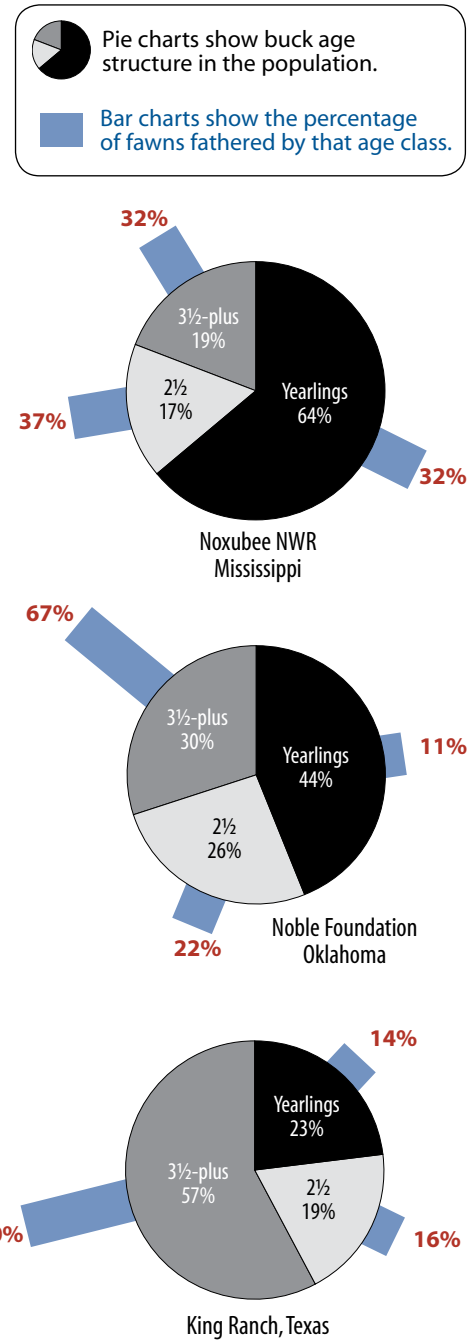
In short, it seems that other factors, likely behavioral ones, play an additional, important role in establishing a pecking order. When it comes to a buck achieving dominance, *attitude* really does matter.

And then, even once dominance was determined, it wasn't necessarily stable or constant. It turns out that a select few dominant bucks do not hold a monopoly on breeding success after all. So-called "subordinates" weren't shut out of the process. They managed to gain breeding successes of their own, despite a greater rate of success among dominant bucks.

All of these studies and findings that we discussed in the last issue, however, involved captive deer. If we are truly going to apply these changing realizations to create more effective management strategies, we need to know more about how social dominance and breeding success actually operate in the wild. Let's face it – captive studies certainly allow for more control, but they don't necessarily replicate the complex social interactions among deer in their native habitats.

With all of these findings and questions in mind, we conducted studies to further illuminate the truth behind buck breeding success in the wild.

Buck Breeding Success by Age in Three Locations



Into the Wild

Our main goal was to assess the distribution of breeding success in diverse populations of wild deer. In other words, in light of newfound suspicions that a few dominant bucks may not actually have a monopoly on breeding success after all, we wanted to know exactly which deer were gaining breeding success.

Another goal was to assess the effects of population age structure and sex ratio on the distribution of breeding success to lay the ground work for future studies.

We chose three diverse populations of wild whitetails for our studies. All of these populations had very different demographics, which allowed us to determine to what extent breeding success might be dependent not only on the individual deer, but also on the age structure and sex ratio of the population he belonged to. The graphic on this page shows the age structure of bucks in the three populations (represented by the pie charts).

The first was the Noxubee National Wildlife Refuge in northeastern Mississippi, where public recreational harvest of any legal buck prior to the breeding season resulted in a young age structure and unbalanced sex ratio.

The second was the Noble Foundation Wildlife Unit, in south-central Oklahoma, which was managed with typical QDM strategies for a moderate buck age structure and nearly balanced sex ratio.

Our third and final population was the King Ranch, in southern Texas, where highly restricted harvest generated an older buck age structure with nearly balanced sex ratio.

We collected DNA samples from harvested and live-captured deer on all three study sites, then grouped deer from each area into categories. We made groups of potential sires (fathers) according to their age classes, and we also made groups of offspring based on the year in which they were born. We were then able to use genetic-based paternity tests from these three different populations of deer to evaluate the assumption that breeding success is highly skewed toward a small number of mature, dominant bucks.

Abolishing the Monopoly

What we discovered is quite contrary to the belief that a few dominant bucks monopolize breeding. Across all three study areas, in three separate states and with three different population demographics, there was a rather wide distribution of mating. In fact, our results suggest that the same wide distribution of mating success that we discovered in previous studies on captive deer – among dominant and non-dominant individuals, as well as among age classes – also was common in free-ranging populations of whitetails.

The percentage breakdowns among all three study areas are quite revealing. Although buck age structure and sex ratios within deer populations differed greatly among locations, there were three consistent findings. Before we generalize, let's review results from each property.

Despite the high prevalence of yearling bucks at **Noxubee Refuge,** breeding was distributed equally among the three age classes: yearlings sired 32 percent of fawns, 2½-year olds sired 37 percent and bucks at least 3½ years old sired 32 percent of fawns.

At the **Noble Foundation Wildlife**

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Unit, most offspring (67 percent) were sired by bucks at least 3½ years old, but surprisingly yearlings sired 11 percent and 2½-year old bucks sired 22 percent of fawns.

King Ranch results were consistent with those at the Noble Unit. Yearlings sired 14 percent, 2½-year old bucks sired 16 percent of fawns, and bucks at least 3½ years old sired 70 percent of fawns.

On all three study areas older bucks breed disproportionately more than their prevalence within the population and younger bucks breed disproportionately less than their prevalence within the population, which follows the traditional theory. However, we were surprised that breeding success was consistently spread among all three age classes; younger bucks bred even when older bucks were abundant.

The distribution of breeding success across a large number of bucks was equally surprising. We identified parentage for a total of 254 fawns from the three populations. Amazingly, these fawns were sired by 123 different bucks – so much for the idea that breeding is the privilege of a select few! Additional work by one of the authors from wild South Texas populations showed that 24 percent of twin and triplet litters involved "multiple paternity," meaning at least two bucks were involved in siring fawns in those litters.

TES RANDLE JOLLY

Unlike elk, red deer, and some other deer species, whitetail bucks tend and guard receptive does one at a time, sometimes devoting hours to the effort. Younger or less dominant bucks likely gain breeding opportunities while older, more dominant bucks are occupied.

To summarize, older bucks breed disproportionately more than their prevalence within the population, which follows the traditional theory. However, we made two novel discoveries. Regardless of the wide variation in age structure, yearling and 2½-year old bucks sired at least a third of all fawns. Additionally, even within the older age classes, a large number of different bucks were involved in siring fawns within a deer population.

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Key Differences in Mating Systems

So, why is success spread among more bucks than expected for a dominance-based breeding hierarchy, in contrast to expectations of early deer behavioral scientists? Part of the answer may lie in a distinct difference in the mating system of white-tailed deer – as compared to other deer species – that allows for the success of more bucks than might be expected. The other part lies in the difficulty of accurately assessing breeding success based solely on visual observation, as was used by early researchers.

White-tailed deer use a tending-bond mating system. The buck roams widely in search of an individual estrous doe; when one is found, he may spend many hours tending, waiting for her receptivity and possibly breeding her multiple times.

Other deer species, such as red deer in Europe or elk in the United States, have a harem mating system and rely more heavily on a strategy called "contest competition." Deer species with harem mating systems typically are found in relatively open environments where large groups of deer move together in herds to capitalize on seasonally available foods. This behavior is also advantageous to the herd by having more individual deer watching for predators. A product of this herd behavior is easy access to estrous females, thus a stag or bull does not have to search very long to find a receptive female. In these situations, the most dominant males (stags or bulls) – typically older, larger-antlered males in better physical condition – are able to defend harems and gain exclusive breeding access to females. Young males choose not to challenge these mature males for breeding access, choosing instead to expend energy on skeletal growth and achieving physical maturity before investing energy in breeding effort. In the harem and "lek" mating systems of red deer and other highly polygynous species (where one male may mate with multiple females), studies do reveal that only a few mature males sire offspring, while many young males as well as subdominant mature males are unsuccessful.

Our findings confirm that the red deer's breeding pattern does not occur in white-tailed deer. A wide distribution of breeding success among individual bucks and age classes indicates that age and social dominance are not the sole determinants of white-tailed deer breeding success. Young or subordinate deer are able to successfully breed because a dominant buck can monopolize access to only one doe at a time. The ability of young or subordinate bucks to breed is a product of simple logistics. When there are not enough dominant bucks to tend every estrus doe, particularly during peak rut, breeding opportunities exist for younger or subordinate bucks. The extent of these breeding opportunities depends on the sex ratio - the more skewed the sex ratio, the more breeding opportunities for young or subordinate bucks. Additionally, in some instances a young or subordinate buck may sneak in and breed an estrus doe while two older bucks are fighting for access to her.

Not only does the type of environment where a deer species occurs affect their breeding system, it also influences how earlier wildlife scientist conducted studies to examine breeding behavior. The whitetail's preference for dense habitats makes it difficult to observe actual copulations by whitetails, which is likely a big part of the discrepancy in what behavioral observations indicated to researchers dur-

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ing the 1970s and what our genetic studies reveal. In fact, the most intensive behavioral study of free-ranging white-tailed deer, by Dr. Dave Hirth, recorded a mere four copulations in 3 breeding seasons of observation spent on top of telephone poles in the South Texas brush country. We now know that just because a single dominant buck is observed tending a doe, it doesn't mean that he is the only one breeding her.

Conclusions

We still have a lot to learn about how adult sex ratio and buck age structure affect breeding success. However, MSU Deer Lab studies clearly demonstrate that physically immature bucks successfully breed over a wide range of demographic conditions and geographic locations. These younger and socially subdominant bucks did not sire the majority of offspring, but certainly a large proportion of them. In fact, physically immature bucks, of 1½ to 2½ years of age, collectively fathered at least a third of offspring in all populations, even on the King Ranch where mature bucks were abundant.

The results of our genetic studies are a start toward a better knowledge of the mating system of white-tailed deer. Such an understanding is important for many reasons.

For one, it shows the futility of attempting to positively alter the genetic characteristics of a free-ranging deer population by selectively removing "cull bucks." This is because a great number of bucks are breeding, not just a few, older, larger-antlered bucks. This differs greatly from other species like bighorn sheep where a study provided convincing evidence that intense harvest of mature rams could impact the genetic quality of the population. Equally important in whitetails, it shows that an occasional errant harvest of a few high-quality young bucks will not significantly harm population genetics.

Please note: we differentiate between impacting genetic characteristics and improving average antler size within the "standing crop" (the individuals within a population). Selective harvest can improve or degrade average antler size depending on the type of animals targeted; this affects average antler size in the surviving bucks but not the genetic characteristics of the population. Please see our previous article "Selecting Bucks For Harvest" in issue four of 2008 Quality Whitetails.

We can easily sum up the management implications from our research into deer breeding success. In spite of our best or worst intended management actions, the whitetail's breeding system is pretty much error-proof when it comes to selective-harvest impacts on the genetic characteristics of a free-ranging deer population.

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