Are Whitetail Deer Antler Characteristics Inherited?

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Part 2 of Spikes Are Not Inferior - Or, Are They?

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If so, then the antler characteristics within a deer herd can be changed through selection. If not, then selection will be of no value. Data will be presented which supports the belief that antler characteristics are indeed inherited (genetically controlled) and that selection can change the characteristics of a deer herd. Each time a deer is removed from the herd (death, harvest or migration), there is selection because those remaining become the parents of the next generation. Remove the undesirable and the herd will improve. Remove the desirable and the herd quality will decrease.

If whitetail deer antler characteristics are genetically controlled, then it is possible to manage a deer herd in such a way as to change the average antler quality of the herd without waiting 10,000 years for Mother Nature to make a change.

Data collected at the Kerr Wildlife Management Area and published in a scientific journal (July 1994, Heredity) indicate that antler characteristics are inherited and the heritability estimates from this article are shown in Table 1. Although the heritability of a trait is constantly changing due to gene frequency changes caused by natural (death, migration) and artificial (harvest) selection, these estimates give a good indication of the magnitude of the influence of genetics. Heritability may be defined as "An estimation of the degree by which a characteristic is controlled by heredity as compared to the influence of the environment and other factors." It is the percent of the total variability of a characteristic (antler weight) which can be attributed to heredity (genetics). The heritability estimate for antler weight shown in Table 1 suggests that 75 percent of the variability in antler weights (mass) may be attributed to heredity.

I have no strong feelings one way or another concerning harvesting or protecting spikes and/or does, trophy management, deer hunting or high fences. I have a background in population genetics and statistics and wish to present more data collected from research conducted at the Kerr Wildlife Management Area. The views presented in this article are the views of the author and should not be assumed to be those of the Texas Parks and Wildlife Department.

In the 1991 Sept/Oct issue Newsletter of the Texas Section of the Society for Range Management, Steve Nelle reported that Dr. Harry Jacobson "summarized findings from 15 years of records from a 150-head captive deer herd" as follows:

1. Looking at antler points of yearling bucks provided no correlation to antler development later in life.

2. Spike-antlered yearlings were just as likely to produce large antlers later in life as 6- to 8-point yearlings.
3. The prevalence of spike-antlered yearlings was correlated to birth date. No June-born bucks produced spike antlers, while 38 percent of September-born bucks produced spike antlers.
4. Overall, the captive herd only produced spikes on 20 percent of yearling bucks, while adjacent private-land produced spikes on 60 percent of yearling bucks, the only difference being nutrition.
5. The best two sets of antlers produced over the 15 years (168 and 195 B & C points) were both 3-point bucks as yearlings.
6. You can do little or nothing to improve antler genetics except to leave obviously superior bucks in the herd.

Although I accept Dr. Jacobson's results, no supporting data was presented and the statements conflict with results from 20 years of genetic research at the Kerr Wildlife Management Area and results from a study in Louisiana which was reported at the Southeastern Association meeting in 1992. Data reported in 1989 (Effects of Genetics and Nutrition, TP & W) show a correlation between first and third set of antlers for 64 deer to range between 0.60 for main beam spread to 0.83 for total antler weight.

Data reported in this article (Tables 2 and 3, and Figure 1) are from 104 deer for which 1.5, 2.5, 3.5, and 4.5 year old deer, we are comparing 104 yearlings to these same 104 deer as 4.5 year-old deer. I realize Tables 2 and 3 are difficult to read, but they help answer the question, "What will a yearling buck be at 4.5 years of age?" Table 2 contains information about total antler points as yearlings and total antler mass (weight) at 4.5 years. In Table 2 there are 30 yearlings which had 2 points and 10 (33 percent) of these had 8 points at 4.5. There were 11 yearlings with 8 points and only 2 (18 percent) had 8 points at 4.5 , but 8 (80 percent) had 10 or more points at 4.5. No yearling with 2 points attained 10 or more points at 4.5. There were 31 deer with 10 or more points at 4.5 and 23 (74 percent) of these had 6 or more points as yearlings and 8 (26 percent) had 3, 4, or 5 points as yearlings. No 10-point 4.5 year old deer was a spike as a yearling. Table 3 shows the total antler weight at 4.5 years for these same 104 deer. The 30 yearlings with 2 points all had antler weights less than 1,000 grams while 10 of the 11 yearlings with 8 points had antler weights greater than 1,000 grams while no deer with 2 points as yearlings had antler weights greater than 1,000 grams.

These 104 deer were divided into three groups according to the number of antler points as yearlings [2 points (N=30), 3,4, 5 points (N=25) and 6 or more points (N=49)] and presented in Figure 1. The 6-point group was heavier (body weight) at 2.5 than the 2-point group at 4.5 and this relationship continued for all six characteristics. The 2.5 year 6-point group was better than the 2-point group at 4.5 years.

Figure 1 and Tables 2 and 3 suggest a strong relationship between the first and fourth year measurements. Although no Boone and Crockett scores are reported from the KWMA, no spike or 3-point produced 10 points at 4.5 years, while 31 of the yearlings with 4 or more points produced 10 or more points at 4.5 years (Table 2). No spike produced a total antler weight over 1000 grams at 4.5 years. Only one of the 3-point deer

and one of the 4-point deer produced a total antler weight over 1,000 grams, but 40 of the 49 6-point or greater produced antler weights greater than 1,000 grams (Table 3).

I agree with Dr. Jacobson on point #6. Leaving "obviously superior bucks in the herd" is the same as removing "obviously cull bucks" from the herd. Now, we must define what is a superior buck and what is a cull buck. These definitions change with each herd and deer manager. In #4, Dr. Jacobson says that only difference is nutrition and in #6, he leaves "obviously superior" bucks in the herd. I find this somewhat confusing because leaving "obviously superior" deer in the herd implies that he believes that antler characteristics are inherited and that selection can change the quality of antler characteristics in the next generation. Actually, both genetics and nutrition are important and nutrition can "mask" the genetic effect, but it cannot replace the genetic effect. It is possible to "starve the antlers off" a deer which is genetically capable of producing good antlers, but not possible to "feed good antlers onto" a deer which is not genetically capable of producing good antlers.

W.A. Armstrong published an excellent article titled "The Management of Spike Bucks" in the spring of 1994 issue of "Making Tracts for Texas Wildlife" in which 10 conclusions based on the deer research at the Kerr Wildlife Management Area were presented. The title could have been "The Management of Whitetail Deer." These conclusions are based on data from 20 years of research records from more than 1,600 total deer, 1,103 sets of antlers from 384 different deer and include the following:

1. Antler development is genetically based. Not all deer have the same genetic potential.
2. Nutrition does affect antler growth.
3. Early or late birth does not affect antler development if deer receive adequate nutrition.
4. The majority of yearling spike bucks will produce smaller and fewer points in following years than will fork-antlered yearlings.
5. You can improve a herd by selectively removing inferior antlered deer and allowing the deer with good antlers to breed.
6. Does provide half of the genetic potential for antler development.
7. Average yearling bucks on good range should have six points.
8. Even when most bucks are spikes, removing them will not endanger the breeding potential.
9. Antler development with age up to a point.
10. The best time to manage for genetic improvement is during periods of nutritional stress.

If anyone is interested in a concentrated dose of genetics and statistics and a summary of research at the KWMA and will so indicate to the editor, he will forward the names and addresses to me and I will schedule and present an all-day seminar at the Kerr Wildlife Management Area. I would also invite each reader to visit the KWMA, see the facility and listen to the presentation by Donnie Harmel and/or Bill Armstrong.

Frequency distribution of total antler points at 4.5 vs. total antler points at 1.5 years for 104 white-tailed deer

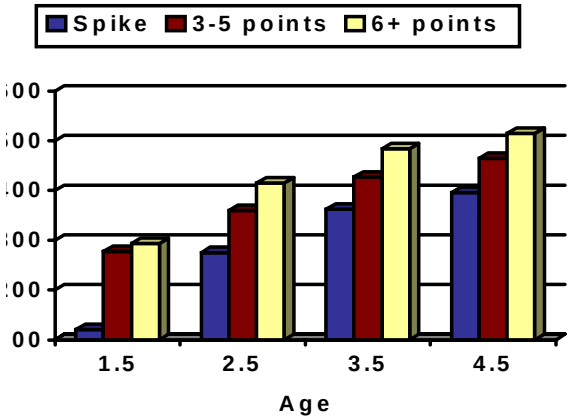
Points at 4.5 years	Total antler points at 1.5 years										
	2	3	4	5	6	7	8	9	10	11+	Total
12+				2	1	3	2	1	1		10
11				1	2	1	2				6
10			3	2		3	4	1	2		15
9	1	1		4	9	6	1				22
8	10	1	6	4	2	5	2				30
7	4				1						5
6	7	1									8
5	3										3
4	4										4
3											0
2	1										1
Total	30	3	9	13	15	18	11	1	3		104

Frequency distribution of antler weight at 4.5 vs. total antler points at 1.5 years for 104 white-tailed deer

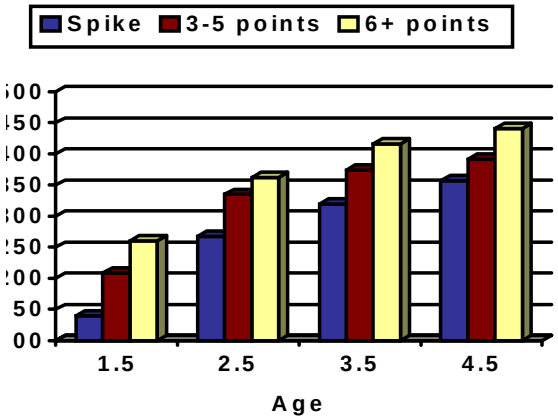
Antler Weight at 4.5 years	Total antler points at 1.5 years										
	2	3	4	5	6	7	8	9	10	11+	Total
20*							1				1
19											
18							1		1		2
17						1		1			2
16				1	2	1					4
15				1		1	1				3
14					2	3	1				6
13					1	4	2				7
12				3	1	1	3		1		9
11			1	3	1	3			1		9
10		1			3	1	1	1			7
9	1		2	3	3	2					11
8	3				1	1	1				6
7	5		2	1	1						9
6	4		3								7
5	3			1							4
4	8	2	1								11
3	1										1
2	4										4
1	1										1
Total	30	3	9	13	15	18	11	2	3		104

* 1=100-199 gms, 10=1000-1099 gms, etc.

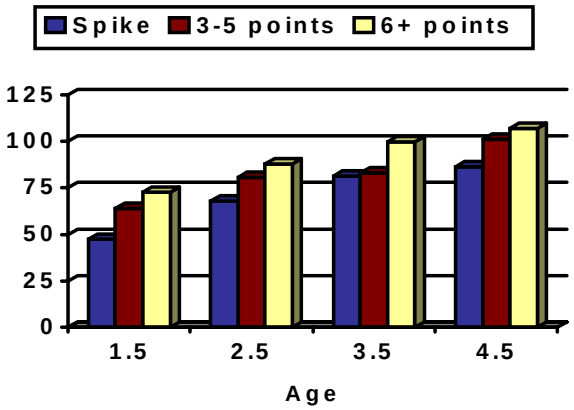
MAIN BEAM LENGTH (mm)



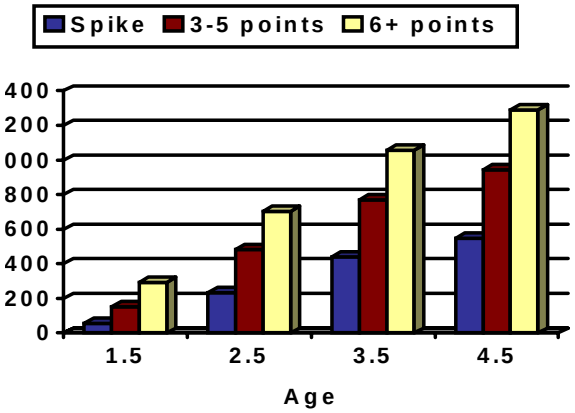
MAIN BEAM SPREAD (mm)



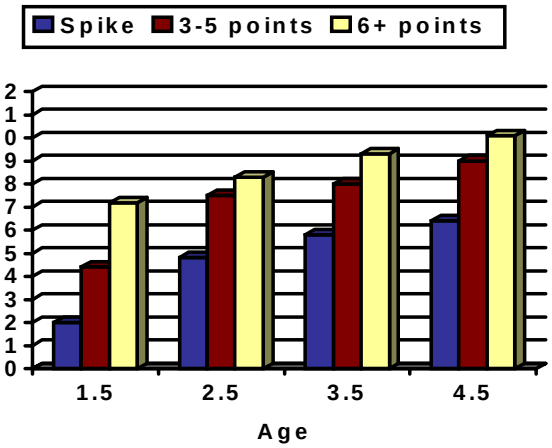
BASAL CIRCUMFERENCE (mm)



TOTAL ANTLER WEIGHT (gms)



TOTAL ANTLER POINTS



LIVE BODY WEIGHT (lbs)