

A Year in the Life of the White-tailed Deer What times the Rut?

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By the time you read this, the peak of the rut should be pretty much history for most of the state. However, if you should happen to be hunting in the extreme southwestern corner of the state, you can still look forward to a rut peaking sometime in mid-December.

In last month's issue of GON, Daryl Kirby presented an excellent article on the timing of the rut. Accompanying the article was a map indicating the timing of the peak of the rut in various regions. This map provided some invaluable information to help hunters plan their trips afield depending on where they hunt.

The map also provided some of the clues for a biological riddle that has intrigued biologists and hunters alike for decades. An astute deer enthusiast certainly would have noticed that the peak of the rut across the state can vary by as much as 2 months, and most of this variation is due to the rut occurring progressively later in an east-to-west direction. This trend continues beyond the state borders, with an earlier rut in coastal South Carolina, and a progressively later rut through Alabama, Mississippi and into Louisiana. Interestingly, the rut gets earlier again in east Texas and then progressively later across the Lone Star state.

The riddle here is 'Why should the rut vary across the state and the Southeast?' and related to that is the question of 'What then is the mechanism that triggers the rut?'

If you pose these questions to 10 different biologists, you're likely to receive 10 different opinions, because we really don't know the answers. There have been numerous theories proposed which suggest a variety of influences such as a genetic cue depending on the stocking source of the deer, the lunar cue dependent on the timing of the full moon, and the herd age structure and sex ratio. Let's take a look at these theories based on some scientific data (but liberally sprinkled with my opinion!).

One thing that we know for certain is that in the temperate regions of North America, the breeding chronology of whitetails is primarily under the influence of changing photoperiod. Deer, like a variety of other animals, are short-day breeders. This means that their breeding season occurs at a time when the length of the day is decreasing. Inside the deer's brain is a gland called the pineal gland that secretes a hormone called melatonin. However, this gland only secretes melatonin under the influence of darkness. So, as nights grow longer, the portion of the day during which melatonin is secreted increases. So, it is in this way that deer can keep a 'chemical clock' that tracks the changing seasons. As the duration of melatonin secretion increases, it allows a series of other physiological changes to occur. Testosterone levels in the buck start to increase

resulting in maturation of the antlers, shedding of velvet, increased aggression, increased sperm production, and increased interest in the does. Similar things occur in the does, with increased ovarian activity resulting in changing levels of estrogen and progesterone, which ultimately culminate with estrus and ovulation.

In the northern portions of the whitetail's range, timing of reproduction is critical. Fawns born too early as a result of early breeding would be at risk of a spring storm, or maternal does may not have had sufficient time to restore body condition in the spring to provide sufficient care. Similarly, late born fawns may not have sufficient time to grow and develop sufficient fat stores to allow them to survive their first winter. In addition, photoperiod changes much more rapidly in more northerly latitudes, allowing the melatonin clock to time reproduction more precisely.

In southern ranges, the timing of reproduction is less critical, and fawns born early or late likely would have a greater chance of survival than those born 'up North'. Photoperiod also changes more slowly in southern latitudes. Therefore, because seasonal climate changes are not as severe, fawns born in central Georgia in late May or early June tend to have about the same survival rates as fawns born in July in portions of Alabama, or even August in Mississippi.

So, although photoperiod is the overriding factor that ensures that breeding in the South occurs in the fall or winter, the somewhat forgiving climate in the southern states allows the timing of the rut to differ among different deer herds. But the questions remain: Why do different deer herds have different rutting periods across the south? and What triggers the rut in the different areas?

Probably the most commonly proposed explanation for the differing breeding dates across the South is that deer herds were restocked in the mid-1900's with deer of varying origin, and the current breeding dates reflect the origins of these herds. In other words, there appears to be a genetic tie that dictates breeding chronology based on where the deer originally came from.

However, in my opinion, the stocking source theory doesn't explain all of the trends that we see, and certainly is not well supported by the data. For example, the origins of the deer herds in many Piedmont counties (and other parts of the state as well) were primarily some of the coastal islands including Blackbeard, Ossabaw, and Jekyll. On these islands, most breeding occurs in late September or early October. However, the peak breeding in the counties receiving many of these deer usually falls around early or mid-November. As another example, much of Alabama was restocked with deer originating from Clarke and surrounding counties in the southwestern portion of the state. However, the timing of breeding across Alabama can be highly variable. These and other examples suggest that it is highly unlikely that there is a genetically-tied cue that triggers when the rut will occur. We've been able to further substantiate this in our research facility where we have been able to successfully change the timing of when does naturally come in heat, something that couldn't be done if the timing was based on genetics.

The timing of the full moon in September or October also has been suggested as the triggering mechanism for the rut. Again, this clearly does not fit the data available because moon phase is the same all across the South, and the timing of the rut is very different. In a recent study, we looked at the breeding dates of >2,500 does from 7 states across the United States, and found absolutely no relationship between breeding dates and moon phase.

In a number of studies across the Southeast, the herd sex ratio and buck age structure has been implicated as a major influence on the timing of the rut. Very heavy male harvests with limited doe harvests leads to young male age structure and sex ratio skewed toward females. In areas where a significant portion of the buck harvest occurs early, sex ratios may be even more skewed at the time of the rut. These herd conditions can affect the rut in two possible ways. First, the fewer the bucks to go around, the greater the chances that a female will not conceive during her first estrous cycle. If that happens, she must wait through another complete cycle (about 26-28 days) before coming into estrus again.

In addition, we've found that simply the presence of mature males can have an effect on the timing of estrus in females. In a study that we conducted at the Smithsonian Institution, we found that simply the scent of urine from males can have a stimulating effect on the reproductive physiology of females.

Nevertheless, although age structure and sex ratio can have an effect on the timing of the rut on local areas, it still does little to explain why rutting seasons vary broadly across the Southeast.

Thus far, none of the mechanisms that have been proposed (as discussed above) seem to provide a plausible explanation of why rutting times differ. Which leads me to my opinion – deer herds differ in the timing of breeding simply because they can! Let me explain what I mean. We know that changing photoperiod is the primary triggering mechanism responsible for timing the breeding season. However, there may be some small differences in how different deer herds time their reproduction based on photoperiod. Or, stated differently, deer herds differ in how their 'reproductive alarm clock' is set. Some may go off in response to photoperiod length typical of October, whereas others may require more hours of darkness (i.e. longer melatonin secretion) before the alarm goes off. However, the timing of the alarm is not set by genetic cues, but rather this timing can be physiologically ingrained in the herd, and passed on from mother to daughter. Studies have demonstrated that there are melatonin receptors in the developing fetus that respond to melatonin levels in the mother. Therefore, it is possible that the melatonin cue may be set in a female while still a fetus. Thus a daughter would be expected to breed at roughly the same time as her mother. In this manner, the timing of reproduction could be passed from mother through successive generations.

Unlike northern herds, environmental conditions are less likely to weed out those individuals that breed at a different time. The possibility of winter mortality is not a significant factor in the Southeast, and therefore does not limit breeding to one specific optimal time. So, deer in Alabama may breed in December or January simply because

there is no overriding factor such as winter weather that forces them to breed earlier. And, once this reproductive timing becomes ingrained in the deer herd, there may be little reason to change. Fawns born earlier or later than the 'normal' fawning season may be at increased risk for predation or other mortality, so the timing persists.

Whatever the reason for the different rutting periods across the Southeast, there likely is little that we can do to change them. Proper deer herd management may have some minor impacts on the timing and intensity of the rut. But perhaps the best thing we can do is to enjoy the diverse breeding seasons and be thankful that there are still a lot of mysteries about this creature that we don't yet understand.