

## Rutting moose and the social significance of antlers

by Ted Bailey



*A rutting bull moose tests the air for the scent of a cow moose standing just a couple of feet in front of him to determine her reproductive status (credit: Ted Bailey).*

On a hike on the Kenai National Wildlife Refuge in early October, I came upon a group of rutting moose. There were at least two bulls and four cows, one with a calf. I was captivated watching them interact.

Much of what we know about the reproductive biology of moose in Alaska is from studies by Chuck Schwartz, the late Al Franzmann and others who worked with captive moose at the Alaska Department of Fish and Game's Moose Research Center at the end of Swan Lake Road. We know about the behavior of rutting moose in Alaska from biologists Dale Miquelle and Vic Van Ballenberghe and others who studied a naturally-regulated population of moose in Denali National Park. And much of what we know about the evolution and social significance of moose antlers is based on studies by the late Anthony "Tony" Bubenik, a Canadian research scientist and once a world renowned authority on horns and antlers. He once studied rutting moose on the Kenai Peninsula and I was fortunate to meet and converse with him in the 1970s.

In most cow moose, the typical estrous cycle—the hormonal and physiological changes—starts in the late summer and usually lasts 24-25 days. However, most cows are receptive to bulls for only a brief 15-26 hour period during their cycle. The average date of first breeding for most cow moose in Alaska is October 5 with a mean calving date of May 26, but it can vary from September 28 to October 12.

Although the majority of cows conceive during their first estrus, studies have shown that if a cow is not bred during her first estrus cycle, she can recycle up to six more times which means she could potentially be bred as late as March. The average calving date for second-estrus-bred cows is June 15 and third-estrus-bred cows' average calving date is July 3. Delayed breeding may thus explain the difference in the sizes of moose calves we sometimes see in the spring and summer.

In contrast to cow moose, bulls must be ready to mate on short notice if the cow accepts them, but bulls pay a price—physiologically—for growing antlers

whose size often determines who will breed. The main mineral in antlers is hydroxyapatite or crystalline calcium phosphate. Before the rut, in order to harden or mineralize their antlers, calcium is often withdrawn (decalcification) from the bulls' skeletal bones. Because prime bulls do not feed for about two weeks during the rut and thus cannot rapidly replace this lost calcium, the bones in their bodies—mainly the shoulder blades and ribs—become soft and fragile, a temporary condition (osteoporosis) which subjects the bulls to injury and is the reason why some bulls have broken shoulder blades and ribs. Prime bulls may also lose 12-19 percent of their pre-rut body weight from not eating during the rut.

The cessation of feeding by prime bulls before and during the rut coincides with scent-urination marking. Prior to, during and after the main rutting period, bulls scent mark by rubbing trees, digging rutting pits in which they urinate and splash urine-soaked soil on their antlers and bodies, salivate copiously, and saturate the bells hanging from their necks with saliva and splashed urine to attract cows. Scent urination by bulls attracts cows and is believed to induce cows to ovulate. Cow moose also scent mark in pits, but are more likely to do so during peak rut by rubbing trees, perhaps to advertise their estrus condition. Bull moose also scent mark trees later in the rut perhaps to attract females that were not bred earlier.

The urine, saliva and other body excretions contain pheromones that presumably advertise the sexual status of the moose. Bull moose assess the breeding status of cows by smelling the cow's urine or genital area. Sometimes they deeply inhale the cow's scent into their vomero-nasal (Jacobson's) organ in the roof of their mouth by extending their neck and curling their upper lip, a behavior known as flehman. And as we moose hunters know, bulls also vocally advertise their readiness to mate by their "grunting" calls.

Fossil evidence suggests that antlers first evolved millions of years ago to protect the head and eyes of ancestral ungulates from thorny vegetation and during sparring with other males. Antlers were too fragile and sensitive to evolve as weapons against predators. Later, antlers slightly changed their position on the head to become primary structures of social significance and indicators of dominance.

While moose antlers are growing from  $\frac{1}{2}$  to  $\frac{3}{4}$  inch

per day, they are covered with a very sensitive and vascularized skin (velvet) which lasts about 140 days. The loss of velvet is likely controlled by photoperiod and shedding begins in late August to early September. Antlers are usually cast in December by mature bulls but younger bulls may retain their antlers through March. It takes 4-5 years for the final antler shape to develop in a bull, prime antlers are carried by bulls 5-12 years old, and the optimal antler size and form is reached around 10 years old.

Antler size and configuration are important in determining dominance among bulls because they compete with each other for the opportunity to breed. Smaller-antlered bulls usually give way to larger-antler bulls without a contest. But bulls with similar-sized antlers may spar each other to determine dominance, sometimes fighting vigorously and becoming injured.

However, they may also merely display the size and form of their antlers in a ritualized manner with the sub-dominant bull conceding to the bull with the larger antlers without a fight. Because larger and heavier bulls usually have the largest antlers, it is easier and less dangerous for competing bulls to determine dominance by antler size by ritualized displays rather than by trying to estimate body size and mass by physical combat.

In a naturally-regulated moose population in Denali National Park, large bulls accounted for 88 percent of all copulations with cows during the rut. However, the ultimate decision to accept or reject a bull regardless of its rank is decided by the cow. In moose populations where the natural sex and age structure have been altered, breeding may be prolonged and conducted by younger, immature, or inexperienced bulls regardless of antler size. Tony Bubenik maintained that the rutting period of moose should be as short as possible to avoid a prolonged rut with recurrent estrus cycles and extended or delayed calving periods.

*Dr. Ted Bailey retired from the Kenai National Wildlife Refuge where he was the supervisory wildlife biologist for many years. He has lived on the Kenai Peninsula for over 38 years and still maintains a keen interest in its wildlife and natural history. Find more information about the Refuge at <http://kenai.fws.gov> or <http://www.facebook.com/kenainationalwildliferefuge>.*