



Reproduction of an eighteenth-century print of a Lapland reindeer in *Allgemeine Historie der Reisen zu wasser und zu lande*. XX band, Leipzig, 1771. (Collection of books printed before 1800 in library of the Arctic Institute of North America, Montreal.)

THE FUNCTION OF THE BROW-TINE IN CARIBOU ANTLERS

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VARIED and fanciful are the uses which have been attributed to the brow-tine of the antlers of Barren-Ground Caribou (*Rangifer tarandus*). It has been called an ice pick, a snow shovel, and an eye shade. Unfortunately, no one has ever given an eye-witness account of its actually being used in any of these ways. I would like to describe a way in which I have seen the brow-tine used and to discuss how this has selective value and could therefore be a factor in its evolution. The following discussion is derived from observations on *R. t. groenlandicus* in northern Manitoba and *R. t. groenlandicus-granti* intergrades in northwestern Alaska (Nomenclature after Banfield, 1962).

It is now well known that the antlers of the Cervidae are primarily social in function. When fully matured and cleaned of velvet they are erotic zones (Darling 1937). In caribou, the erotic stimulation apparently occurs when the antlers are threshed in vegetation or when they are rattled against those of a companion.

Antler-threshing is an integral part of the courtship display of buck caribou and thus has an epigamic or sexual function. In courtship display the buck threshes bushy vegetation (shrubs of *Salix*, *Betula* or *Alnus* or, in some regions, dwarfed individuals of *Picea* or *Larix*), "hunches" and tests the does by the modified threat pose (Pruitt 1960). During the hunch there is frequently a secretion from the penis, followed by padding or tramping movements of the hind legs. See Espmark (1964) for photograph of this pose in Old World reindeer. In Moose (*Alces alces*) the tramping phase has further evolved into the formation of a scented "mud puddle" (Knorre 1959) in the Old World or "rutting pits" (Geist 1963) as they are known in North America. I have never seen the padding movements of caribou developed this far. The threshing may also occur as an interlude in an antler-rattling bout with another buck or perhaps may follow such a bout.

Epideictic displays are specially-timed communal displays evolved to provide a homeostatic control of population size (Wynne-Edwards 1962); thus threshing may also play an epideictic role. I have not observed epigamic antler-threshing in the later, intensive pre-coital phase of courtship when the buck devotes his full attention to a single doe. (See Bergerud 1961 for complete description of courtship in another subspecies, *R. t. caribou* in Newfoundland.)

Epigamic antler-threshing is quite different from velvet-cleaning antler-threshing. The latter is basically comfort-seeking behaviour and occurs before the rut begins, frequently in a different geographic region from the rut, and does

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not appear to be a consummatory act. Velvet-cleaning is sometimes quite vigorous and violent and, in its later stages, it may develop into epigamic antler-threshing. When cleaning velvet the buck rubs the antlers against vegetation not only laterally but also vertically. Each beam or tine receives careful individual attention and is rubbed until all traces of velvet are removed. This process may consume several days or even a week. The buck frequently interrupts the cleaning to eat the strips of velvet torn from the antlers.

When preparing to engage in epigamic antler-threshing the buck typically approaches a bush or patch of vegetation and lowers his head in the attack pose (Pruitt 1960) or "antler threat" pose (Lent 1964). In this pose the muzzle now nearly touches the ground and actually points somewhat posteriad so that the long axis of the brow-tine is nearly vertical (see cover picture). The neck remains virtually immobile and the head is rotated from side to side so that each antler is alternately swept down and horizontally across in front of the animal. The stems of the shrub are struck by each antler beam at approximately a right angle; therefore they offer maximum resistance to the beam's progress. During these movements, the brow-tine describes an arc back and forth in front of the face. A fully-developed brow-tine, almost an equilateral triangle in shape, thus very effectively sweeps a clear path through the branches and prevents them from raking across the buck's eyes.

The necessity of such a protective device is emphasized when one sees how vigorously a buck threshes. Moreover, the act of epigamic antler-threshing (which is probably a ritualized derivation of the type of threshing used in cleaning velvet) appears to be, in itself, a consummatory act. That is, it is stereotyped, repetitive, apparently governed by the lower brain levels, and appears to be the culmination of an appetitive sequence. A buck engaged in such threshing is supremely oblivious to potential hazards to his eyes. Thus the enlarged brow-tine has a very real function; it is one of the secondary sexual structures. Undoubtedly the growth and perfection of the brow-tine was concurrent with the evolution of epigamic antler-threshing. Indeed, the very shape of the antlers in male *Rangifer* is intimately associated with epigamic antler-threshing. This conclusion is strengthened when one considers the brow-tine in female *Rangifer* — a cylindrical or, at most, a flattened spike. Only rarely is the brow-tine in does expanded at the tip.

In the forest-tundra areas where I have most often observed the rut of *R. t. groenlandicus-granti* intergrades, willows (*Salix* spp.), with their stiff, relatively non-resilient twigs and stems, are the commonest shrubs. It is noteworthy that Bergerud (in. litt.) has commented that *R. t. caribou* in Newfoundland thresh only small *Larix* and *Picea*, and the bucks in this region frequently lack brow-tines. The twigs and stems of these shrubs and small trees are much more resilient than those of *Salix* and consequently do not offer such a hazard to a buck's eyes.

A possible epideictic function for epigamic antler-threshing becomes reasonable when one remembers that the rut in *R. t. groenlandicus* and *R. t. granti* occurs in low-arctic shrubby tundra or thinly-stocked forest-tundra. Areas of suitable vegetation are relatively limited in extent and are quite susceptible to over-utilization by threshing. Therefore, excessive threshing could modify the critical vegetation in these specialized rutting areas and thus reduce the likelihood of occurrence of complete sequences of courtship and copulation. (For comparison, a detailed knowledge of the rutting behaviour and ecology of the high-arctic *R. t.*

pearyi would be of value). The heterogenic development of the brow-tine may also influence its epideictic role. The brow-tine is not fully developed until a buck is about four or five years old. It is generally agreed that, while male caribou are physiologically sexually mature at perhaps one year of age they do not participate actively in the rutting rituals until three years of age or over. In the case of the well-studied Newfoundland caribou, Bergerud (1961) stated that "large" bucks were responsible for all of the eighteen successful matings he had observed. He also noted that bucks "appear to attain their maximum vigor from age 4 to age 7, and in this interval they are probably responsible for a majority of the successful breeding." Moreover, Bergerud once noted several bucks with antlers that were "short, spindly and with few points, and they appear to be regressing." He collected two of these animals and, by tooth-wear analysis, aged one of them at seven to ten years old and the other at ten plus years. "It appears that the old stags are physiologically sexually potent, similar to the 2- and 3-year-old stags but like the younger animals they are not in the proper psychological state to take part in breeding activity." The restriction of breeding to bucks with fully-developed brow-tines and the susceptibility of the rutting grounds to over-utilization combine to act as an epideictic mechanism, that is, one whereby the population achieves self-regulation in density.

I am grateful to Mr. William D. Berry for his careful and accurate sketch of a buck *R. t. groenlandicus-granti* intergrade engaging in epigamic-epideictic antler-threshing, which is reproduced on the cover of this journal.

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