LEADING THE WAY

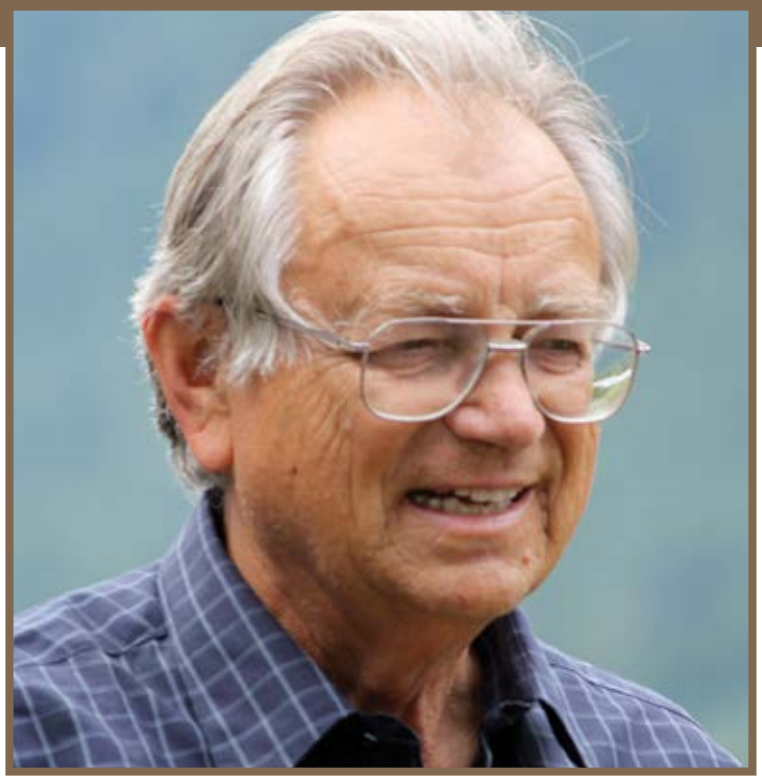
THE CONSERVATION OF NORTH AMERICA'S WILDLIFE

IN MEMORIAM

DR. VALERIUS GEIST

1938 – 2021

A TRIBUTE TO A REMARKABLE MAN, AN EXTRAORDINARY MIND, AND AN IRREPLACEABLE FRIEND.



If you can speak what you will never hear, if you can write what you will never read, you have done rare things.

—Henry David Thoreau

IN MEMORIAM
SHANE MAHONEY
B&C PROFESSIONAL MEMBER
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CARIBOU OF NORTH AMERICA

VALERIUS GEIST
B&C PROFESSIONAL MEMBER

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B&W PHOTOS BY SHANE MAHONEY

There are, it seems, too few rare things in life, too few things that provide irreplaceable perspective on our short journey of awareness. But, once discovered, such rare things forge an unfettered immersion in the beauty and fullness of human existence. For those of us who had the privilege of knowing Valerius Geist personally, rarity was, thereafter, part of our lives. He gave us this gift effortlessly and without ever knowing how we struggled to describe the significance of what knowing him meant to each and every one of us. He had no idea that we came to every discussion with him expecting rarity; nor would he have known that we were never denied. He would have smiled at the notion, nevertheless. He scattered ideas like seeds and we gathered them up and planted them, hoping we would recognize what they became. Far more times than not, he already knew.

Valerius Geist was the epitome of a Renaissance Man; his talents many, his knowledge boundless, and his love of knowledge, greater still. He approached science with an artist's eye and a philosopher's mind and he approached wine making and the quality of a hen's tail feathers in exactly the same way. His work capacity was extraordinary and his contributions to our understandings of wildlife and systems of conservation are legend. It will be a rare thing, indeed, should his grasp of such things ever be exceeded in a single human being.

Born in the Ukraine and emigrating to Austria as a young boy, Geist learned first-hand about wildlife governance in totalitarian regimes. After emigrating to Canada, he studied under Ian McTaggert-Cowan at the University of British Columbia where his pioneering Ph.D. work on mountain sheep in the northern Canadian Rockies led to his first book and the Book of the Year Award from The Wildlife Society in 1971. If there is a single graduate student of wild sheep who has never read this book then they have most likely taken their degrees on other planets. To this day it is considered the sheep bible.

After post-doctoral studies with Nobel Laureate and ethologist Konrad Lorenz, Geist founded a program on Environmental Design at the University of Calgary, Alberta, which he led until his retirement in 1995. His Environmental Design Department was one of the first truly inter- and trans-disciplinary academic programs in wildlife science, and was viewed skeptically by some when it was first founded. But, being out in front was a natural position for Geist and many of his ideas took time to incubate but eventually became part of our accepted understandings. His 1978 book, titled *Life Strategies, Human Evolution, and Environmental Design – Towards a Biological Theory of Health*, was a monumental effort representing a synthesis of his program's approach and his own thinking towards environmental science and the idea of human and nature health. A massively referenced volume, this book was, in many ways, a tutorial on a way of thinking—the integration of evolution and animal behavior that leads to a deep understanding of wildlife and human well-being that can inform conservation efforts and policy. Much of this thinking was decades ahead of similar efforts now spearheaded by international conservation conventions and institutions.

Geist's experiences in Eastern Europe and North America, as well as many other continents, formed the basis for his creation of the concept known as the North American Model of Wildlife Conservation—the key legal and policy initiatives that collectively distinguish the highly successful wildlife conservation legacy of Canada and the United States from other approaches worldwide. Much of the thinking and successes, but also the challenges surrounding this conservation paradigm are captured in the recent book, *The North American Model of Wildlife Conservation*, published by Johns Hopkins University Press, and co-edited by Dr. Geist. In all, Geist wrote nineteen books and had two more in progress at the time of his death. His scientific papers and popular writings numbered in the hundreds. Geist was a captivating speaker, and generous to the many wildlife students and professionals—young and old—who clamored to speak with him. He was a highly social individual and simply loved talking to people and sharing ideas with them.

No tribute to this exceptional man, and dear friend and mentor can pass without a mention of Geist the hunter. He proudly wore his Jager coat to scientific meetings, earned under the strict and challenging hunting protocols and training in Germany. He hunted all over the world, and since retirement hunted on and around his farm in Port Alberni on Vancouver Island, where he and his beloved wife Renate made splendid meals of the animals and plants they raised, and the game he hunted. With Geist's passing we have lost a colleague whose knowledge and insights continued to thrill and inspire right to his last days. Even up to a few short weeks ago conversations with him were dazzling displays of optimism, kindness and hope. His legacy will live on in the ideas he gave us and the lessons on humanity that he taught us. Our hope is what he taught us about how to view the natural world, and how to live our lives with purpose and clarity, will live on among current and future conservationists. Our world will be better for it.

As a tribute to 25-year B&C Professional Member Dr. Valerius Geist, we are running the following introductory chapter to the first edition of *Records of North American Caribou and Moose*, which Dr. Geist wrote.

Geist wrote nineteen books and had two more in progress at the time of his death.

CARIBOU OF NORTH AMERICA

The caribou or reindeer, *Rangifer tarandus*, is the most gregarious and cold-adapted of living deer. It is the most highly evolved runner, with the elk a distant second, and it carries the largest antlers relative to body size. Females give birth to the most highly developed young and produce the richest milk. The caribou is an ecologically plastic, highly successful form to which we humans owe more than a passing nod of thanks, not only because it is the only deer to be domesticated but also, it was once our staple food and the most important prey by far of our wild human ancestors, the people of the Upper Paleolithic who lived at the end of the last Ice Age.

Reindeer fed us reliably for tens of thousands of years. We descend from these early people. Whatever our African origins, the last formative phase of our becoming modern humans was played out in cold, inhospitable northern climates that were rich in big game. Here evolved new kinds of mammals—Ice Age mammals. They are giants of their respective lineages, endowed ornate luxury organs such as large antlers, horns and/or showy patterns of long hair, with massive fat deposits, large brains and high vigor. That made them great explorers and colonizers of continents. No deer species exceeds caribou or reindeer in the size of their geographic distribution. They are found from roughly, north of the 48th parallel, as far poleward as the land goes, around the globe. Zoologically, humans and caribou are more than mere fellow travelers through the ages. They are both excellent examples of Ice Age mammals.

Only the Irish elk surpasses caribou as a runner, judging from the skeletal proportions of that long-dead Ice Age giant, and while it exceeded caribou in absolute antler size, it did not surpass it in relative antler size. For its size, caribou carry larger antlers than the Irish elk. These magnificent antlers are central to much of the caribou's biology. Antler size, highly developed young and rich milk are actually all linked to the caribou's superlative abilities as a speedy, enduring runner. The logic of it is quite simple, because running in open landscapes and quickly losing oneself in a vast sea of space is a very effective antidote to predation. It is, of course, essential that a caribou cow gives birth to a calf that is quickly up and running, and thereafter quickly grows to survivable body size. Thus, a big, highly developed calf at birth and a rich milk supply are vital to a runner. A caribou cow needs to be very good at sparing energy and nutrients from her body's growth and maintenance requirements towards fetal growth and milk. In fact, its crucial. To maximize it's long-term reproductive success, a female caribou also needs to look out for a mate that is at least its equal in sparing resources from maintenance and growth towards reproduction. Only such a bull maximizes the chances of its daughters bearing big babies and giving lots of rich milk.

Well, you guessed it. A bull that runs surpluses sticks such into antler growth, as any male deer would. Large, showy antlers are, therefore, hard proof that the bull was a first-class discoverer and converter of plant food. Now you have a system in which females can quickly select large-antlered bulls because these are superior in generating surpluses. The bulls, in turn, quickly get the hang of advertising their big antlers to females during courtship. And, the rutting caribou bull does put up quite a show for the females he courts, flashing his luxury organs before them, his big antlers and his white, long, flowing—and very costly—neck mane. Luxurious hair indicates the individual tapped into a rich source of rare sulfur-bonded amino acids, cystein and methionine, the constituents of hair. Beauty has thus very real, hard reproductive value. A beautiful caribou bull is thus appreciated by more than starry-eyed trophy hunters.

Antlers play key roles in caribou or reindeer biology. Caribou and reindeer females carry antlers, but not all of them. Females carry antlers in populations that feed on ground lichen. The more caribou that feed on tree lichen, the less likely the females will carry antlers. One can thus divide caribou into two major feeding types, the ground-lichen and the tree-lichen feeders, with some populations enjoying both modes of winter feeding. This is how it relates to antlers in females. Since ground lichens are covered by snow

Large, showy antlers are hard proof that the bull was a first-class discoverer and converter of plant food.

and have to be dug up, caribou dig deep craters and feed on the uncovered lichen. That is bioenergetically expensive work. Consequently, bulls can parasitize the work of females by displacing them from feeding craters. The logical evolutionary response to this practice has been for female caribou to evolve antlers, so as to be able to confront males that contest their hard-won food. It so happens that in deer, individuals with antlers dominate those that have none. The big bulls in winter when the snow is deepest have no antlers, having shed them right after the rutting season. Only the long-yearlings and some two-year-old bulls carry antlers in winter. These are the bulls female caribou must defeat or go hungry. Consequently, female caribou with antlers are the spitting image of yearling bulls. So close is the resemblance that very experienced caribou biologists have been known to shoot caribou cows for scientific collection purposes only to discover testes between the hind legs.

However, where caribou feed on lichens growing in trees, such as mountain or woodland caribou are likely to do, no deep craters need to be dug in the snow. With no craters to defend, cows need no headgear to fight young bulls. Consequently, classic mountain and woodland caribou populations may have few if any antlered females. Since antler size in all deer is first and foremost a consequence of nutrient and energy abundance above the costs of maintenance, body growth and reproduction, barren caribou females can grow astonishingly large antlers. Moreover, such antlers assume male characteristics and can even fool experienced biologists. Also, caribou or reindeer liberated in a rich landscape unoccupied by caribou soon grow huge bodies and antlers. Large bulls then may reach the body mass of bull elk. Conversely, the same kind of caribou on restricted, overpopulated ranges may dwarf in body and antler size. Antler size is thus a barometer of the food abundance enjoyed by an individual during spring and summer, while body size is a good indication of the quality of the food supply to gestating and lactating females. Body size in caribou varies regionally, being largest in some southern populations, in some reintroduced populations and in non-migratory mountain populations close to glaciers. However, body size decreases from south to north, and may be small or very small on some high Arctic islands. On one, Spitzbergen, caribou (*R. t. platyrhynchus*) not only dwarfed, but also in the absence of wolves evolved short legs and the ability to amass huge loads of fat. A mantel of fat surrounds their bodies below the skin. They are almost seals on stubby legs, crowned with antlers. Reindeer of the same stock transplanted to different regions grow to different sizes. Reindeer freed from human surveillance increase 20 percent to 40 percent in mass; males are more affected by human herding than are females. This underlines the plasticity of this species.

As northern landscapes have reduced rates of decomposition, plant remains not degraded by bacteria build up to form soft, often soggy, humus or peaty soils. A big animal can sink deep into such, a fact that makes speedy running difficult unless the runner has exceptionally big feet. This is also the solution hit upon by caribou; they have very big, widely spread hooves that keep them afloat on soft bogs and muskegs in summer, and most snow surfaces in the winter. Their most faithful predator, the "snow dog" or northern gray wolf, if you must call it such, has

Yesterday morning we lost a giant in the field of ecology and beyond. Valerius Geist passed away and left a giant hole in many respects. Even if you don't know who Val is, you probably have heard about the North American Model of Wildlife Conservation. Val is the one who first assembled a list of principles that we now know as the North American Model. It took a thinker like him in the 1980s to realize how special our system of wildlife conservation is on the global stage. He was a visionary thinker and had a brilliant mind for sorting through ecological relationships and forming theories about how things came to be and how they worked. Not all of his theories were supported by data, but they all made us think much more deeply. When one of his theories was later disproven, Val was not only gracious and accepting of that, but genuinely excited that we now have more information about that topic and that we know that theory wasn't valid. We need a lot more scientists like that these days. We were friends and colleagues since the late 1980s and my career has been immeasurably affected by his writings and conversations. He was currently in the process of reviewing my critique of one of his theories and it hurts to know that I'll be going to publication without his feedback. The only solace may be to know that he is probably now drinking his homemade wine with his recently departed wife Renate, who he missed very much.

Dr. Valerius Geist

JIM HEFFELFINGER
B&C PROFESSIONAL MEMBER

Females give birth to the most highly developed young and produce the richest milk.

also evolved with very big paws, much larger than those of dogs of comparable size. Caribou and wolves use their big "hands and feet" as oars in the water, which makes both exceedingly able, fast swimmers. That, too, is a necessity in the North with its abundance of surface water.

Caribou are specialists in finding highly digestible, soft, unabbrasive plant food. One of these is several species of lichens. The most important ground lichens are the reindeer mosses. Woodland caribou feed on beard lichen growing in trees, but also on loose lichen that falls to the ground or snow surface and are picked up by caribou. However, this species can live splendidly by eating many species of succulent herbs, leaves and grasses. Reindeer liberated on various islands close to Alaska have shown it vividly, growing large and heavy antlered in such populations. Forest fires that destroy lichen-bearing, old-growth forests may damage winter ranges, but early plant succession on burns also may create a good food supply for caribou. How populations are affected by wildfires varies with local circumstances.

Strictly speaking, reindeer (*R. t. tarandus*) represent an early Eurasian off-shoot of the caribou. The caribou remained the more primitive branch, judging by the coat characteristics of the bulls. Perfectly good caribou are found some ways distant from the Bering Straits in Eastern Siberia and Kamchatka. One can segregate most caribou from reindeer at a glance; the white neck hair of reindeer usually extends right over the hump of the withers; in caribou it rarely goes as far as the middle of the hump and is found only in barren ground caribou, the form that is closest in appearance to reindeer. Genetic studies show reindeer and caribou separated some time ago. However, they do hybridize when they meet, with the hybrids exhibiting hybrid vigor. Whether that does them much good is another question.

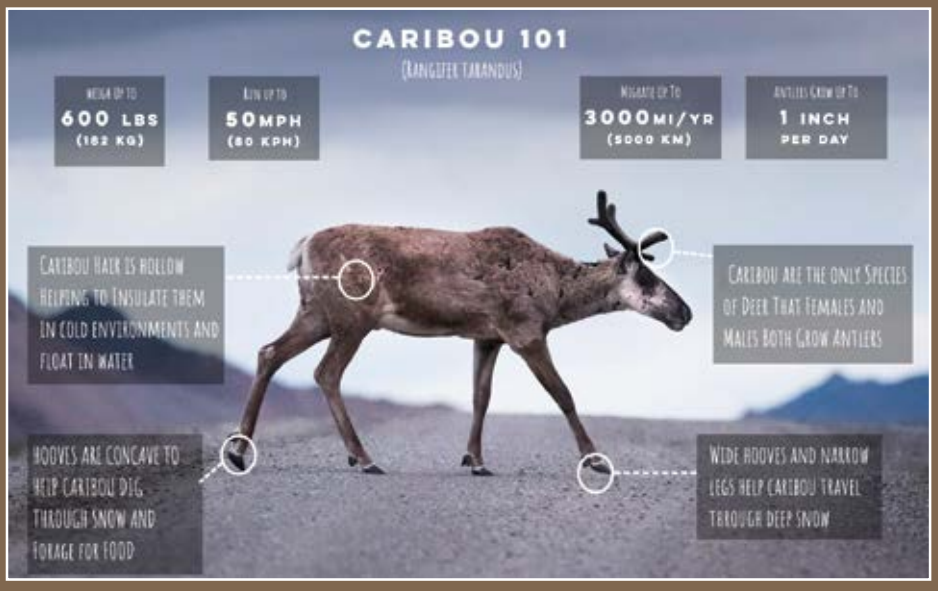
Caribou in North America and reindeer in Eurasia have long segregated into woodland and barren ground forms. In reindeer, the distinction is less extreme than in caribou. Russian scientists reported that domestic adult tundra and taiga reindeer transplanted into their opposites habitat failed to thrive. However, calves born to tundra reindeer held in the taiga grew up not only able to live in the taiga, but also to assume larger-body frame of taiga reindeer. In short, the woodland/barren ground split in Eurasian reindeer is more of an ecotypic than a genetic distinction. We have long suspected that pockets of sedentary barren ground caribou become, for all intents and purposes, big-bodied woodland caribou. Certainly in pelage characteristics, some of the big-bodied, big-antlered "woodland caribou" at the edge of barren ground caribou range are indistinguishable from barren ground caribou.

In the "real" North American woodland caribou (*R. t. caribou*) there are not only diagnostic differences in pelage characteristics, but also in antler form. This distinction has only recently been explained convincingly in the doctoral dissertation of Heather Butler: it appears to relate to different modes of combat and it appears to be genetic. Barren ground bulls, rutting in large, dense herds, follow individual females and are loathe to part with them as these would be quickly lost to another bull in the herd. Consequently, they pounce at a rival, briefly lock antlers at the top, push, twist and disengage to run after their departing females. Woodland bulls, however, guard harems and take on

INTERNATIONAL CARIBOU FOUNDATION

CARIBOU POPULATIONS

According to a 2018 survey conducted by the National Oceanic and Atmospheric Administration:



- Overall abundance of reindeer and caribou has declined 56 percent from a total estimated population of 4.7 million individuals to about 2.1 million individuals over the past two decades.
- Only one of the more than twenty monitored herds is confirmed to have populations near their historic high numbers based on updated estimates since the 2013 Arctic Report Card.
- In the U.S., of the four tracked herds, three peaked sometime between 2003 and 2010 only to decline 57 percent by 2017.
- In Canada, nine herds declined so precipitously that barren-ground caribou are now nationally listed as Threatened, and two herds of Eastern Migratory Caribou are now considered Endangered.
- In Russia, 18 of 19 assessed herds are considered rare, decreasing, or Threatened."

Learn more at www.internationalcariboufoundation.org - contact: info@internationalcariboufoundation.org

rivals in severe, damaging fights. In these, the lower parts of the antlers bear the brunt of the fight and are used to tear wounds.

There are a great variety of caribou in North America. Unfortunately, the classification hitherto was based on the statistical evaluation of skull dimension, an invalid criterion. This led to the lumping of caribou of equal body size; that is, to a confounding of genotype and phenotype. Put another way, when you lump caribou of the same size you confuse apples with oranges. Caribou and reindeer can be, however, segregated reasonably by differences in their coats at rutting time, and to a lesser extent by antler characteristics.

Across the extreme south of caribou distribution, from the Atlantic coast of Nova Scotia to the mountains of British Columbia and Idaho, is found the (usually) large, very dark woodland caribou. It becomes the mountain caribou in the Alberta Rockies and in British Columbia. This, the most primitive of caribou, has only a tiny rump patch and the white rings above the hooves are minimally developed or missing altogether. The body is dark brown, the belly has very little white, the legs and chest are very dark and the white neck mane of the bull is the least developed of all the races. It extends barely to the withers. The light flank stripe and the eye rings are minimally developed. The antlers usually have large "snow palms" and bez palms, but are short and often quite spindly on top.

Another woodland form is the caribou of Newfoundland (*R. t. terraenovae*). However, this is a distinctly different animal from the woodland caribou of the mainland. Newfoundland caribou are brown to gray, and generally have a light coat. The legs are much lighter than the body. As in the woodland form of the mainland caribou, the white neck markings do not continue on the withers. The neck mane in bulls is long, the chest is lighter than the body, and there is much white on the belly. Beside the white primary rump patch, there is a pronounced secondary rump patch. The lateral white stripe is pronounced and blends in with the belly so no dark lateral line is present. Light eye rings are often present, and the antlers are of classical woodland form, but are often larger.

Newfoundland has had a long history of good wildlife management. Consequently, Newfoundland caribou are numerous, while mainland woodland caribou are not. Today they are very scarce, with many populations hovering at the edge of extinction.

Another distinct caribou mistakenly lumped with woodland caribou because of its large size is the barren ground race of Labrador (*R. t. cahoti*). The antlers are classic barren ground form, but with short tines and frequently an unusually wide spread. The white socks on the dark legs are modest. The white of the neck does not extend on the withers, but may extend on the cheeks. The white of the neck extends between the antlers. The rut mane on the neck is long. Faint eye rings may be present. The legs are darker than the body, similar to the dark woodland form, but with larger socks. The chest is dark, and the belly is white. The rump patch is sharply marked off and narrow, while the secondary rump patch is faint. It differs from the barren ground caribou not only in antler characteristic, but also in less extensive body markings and possibly a shorter neck mane.

The old name for the large mountain caribou of northern British Columbia and southern Yukon is Osborn's caribou. It is non-migratory, its ecology apparently tied up with the large glacial fields found within its range. It is intermediate in pelage and antler characteristics between the primitive, dark woodland form and the barren ground caribou. It grades into the barren ground form in the Yukon. Its white flank stripe is narrow and short. The chest is dark. The field of white display hair on the neck is more pronounced than in woodland caribou, but less than in the barren ground form. The eye ring is subdued. The bull's white rutting mane is short. It has a rich, dark reddish brown body color, and there is little sign of a secondary rump patch. The legs are as dark as the body, and there is little white on the belly. The antlers are intermediate in their characteristics between woodland and barren ground forms. Cows are occasionally without antlers. The Osborn's caribou may be a precursor to barren ground caribou, growing large due to a favorable environment coupled with non-migratory habits. These caribou are harem-herders and the cows disperse on mountain ridges at calving time.

The high Arctic Peary's caribou (*R. t. pearyi*, Allen 1902) is often small, about 145

The characteristics of caribou make them great explorers and colonizers of the continents. No deer species exceeds caribou or reindeer in the size of their geographic distribution.

pounds for bulls and 120 pounds for cows, though some populations reach larger sizes. The legs of these caribou are white with a narrow, often indistinct, dark stripe on the front of the legs. There is a pronounced secondary rump patch that shows the white of the legs and the light lateral lines are continuous with the rump patch. The slate-colored coat is light. The white neck field does not continue onto the withers. The belly is white as is the chest. The head is light with a dark muzzle and dark rings about the eyes. Though narrow, light eye rings may be present within the larger dark ring. The body hair is long. The antlers are similar to long-tined barren ground forms. The cows carry antlers. This may be the same caribou as the small, light northeast Greenland caribou, (*R. t. eogroenlandicus*). These high Arctic caribou plummeted in numbers following severe icing conditions in winter and are currently close to extinction. For this and other reasons, the Boone and Crockett Club never designated a separate category for Peary's caribou.

The barren ground caribou (*R. t. groenlandicus*, Linnaeus 1767) is the tundra form of northern Canada and Alaska. It forms very large migratory herds, but also may live in small non-migratory populations. In body color, hair patterns and antler forms, the large caribou from the Alaska Peninsula are barren ground caribou. The pelage is medium dark brown in color, with the legs darker than the body. There are thin white stripes on the back of the legs, while the white band surrounding the hooves is expanded into conspicuous socks. The belly and chest are white. The withers may be white in some males. The rutting mane in bulls is very long. The white rump patch is distinctly set off, but with shades of a secondary rump patch. The antlers are classical American barren ground form, but of the long-tined variety. Excepting antlerless females in some Greenland populations, female barren ground caribou normally carry thin, short but poorly branched antlers.

On high Arctic Prince of Wales and Somerset Islands, and the Booth Peninsula, Peary's and barren ground caribou live side by side, apparently without hybridization. Similarly, migratory barren ground caribou meet non-migratory woodland populations in northwestern Canada with no evidence of introgression. In Greenland, the arrival of barren ground caribou about 4,000 years ago was followed shortly by the extinction of the diminutive west Greenland caribou. Observations of tiny, dark caribou on any isolated mountain range that rises above the ice (nunataks) in Greenland suggest that barren ground caribou can dwarf regionally.

The Queen Charlotte Islands off the coast of British Columbia were once inhabited by a mousy-gray colored caribou (*R. t. dawsoni*) that was the size of a small whitetail buck. Only three male specimens are known, one of which is mounted in the British Columbia Provincial Museum in Victoria, British Columbia. Antler development was very poor, and the females carried no antlers at all. Nothing has been seen of this little island dwarf since the 1920s. This subspecies illustrates the severe dwarfing caribou may undergo in poor environments such as: islands of the Pacific rain forest; mountains surrounded by glacial ice in Greenland; polar deserts of the high Arctic; some Arctic islands; and overpopulated southern populations like the one that inhabits the Slate Islands in Northern Lake Superior. Such caribou populations, struggling just to hang on, are easily lost forever.

Barren ground caribou are currently abundant in northern Canada and Alaska. They are still important as providers of sustenance to residents of the North. Considerable public concern is expressed about their safety and well-being; barren ground caribou do make headlines every so often. Unfortunately, the fate of the dark woodland and Peary's caribou is uncertain. Both have plummeted in number, and artificial breeding programs are being considered. When herds of barren ground caribou expand, they also increase their roaming range and may reappear in localities where they have not been seen for years. Sometimes catastrophic mortality, such as mass drownings come to public attention. On the whole, though, close public scrutiny and good management will secure the future of caribou. ■

DR. VALERIUS GEIST 1938 – 2021