

The Hind Quarter: Animal News You Can Use

Reindeer in the “Great Land”: Alaska’s Red Meat Industry

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The reindeer industry in Alaska has a colorful and complex history, intricately blending anthropological, political, social, religious, economic and environmental factors. Today’s reindeer industry is centered on the Seward Peninsula in northwestern Alaska (see Figure 1). Reindeer herds are also located in Palmer and Delta and on St. Lawrence, Nunivak, Umnak, and the Pribilof Islands.

ORIGIN AND DOMESTICATION

Wild reindeer were once widely distributed across Eurasia (Mirov, 1945). The caribou found in North America are closely related. Both are classified as *Rangifer tarandus* in the deer family, Cervidae. *Rangifer tarandus* is the only member of the *Rangifer* genus. In both reindeer and caribou, there are two broad groups or ecotypes, woodland and tundra, with several identified subspecies (Geist, 1998, 324-328). Domesticated reindeer are tundra or barren ground reindeer from Eurasia, known as *Rangifer tarandus tarandus*, while the barren ground caribou found in north and northwestern Alaska are *Rangifer tarandus granti*. They are migratory animals, moving to calving ranges on the tundra in the summer and to more sheltered areas in the winter (Burch, 1972, 345). Native peoples in northern Europe and Russia and the cold northern regions of the United States and

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Seward Peninsula Range Permits

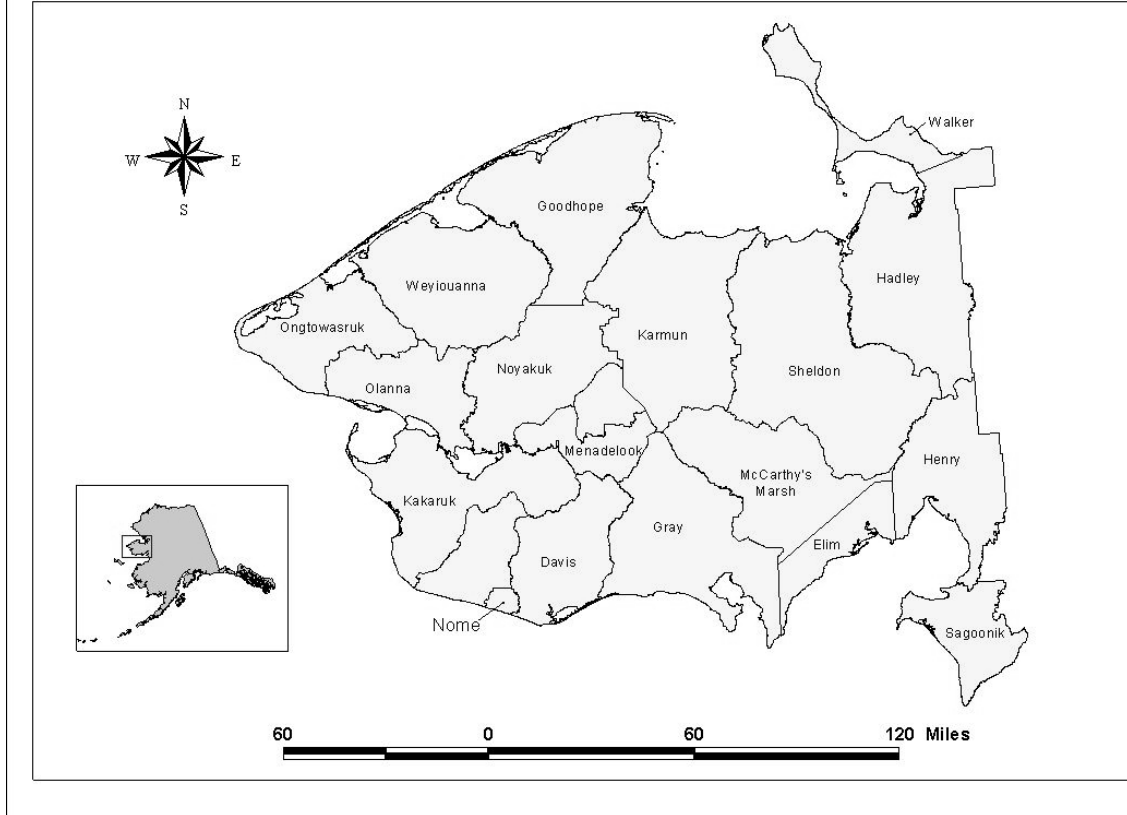


FIGURE 1 Alaska and the Seward Peninsula.

Canada have hunted reindeer and caribou to provide food and clothing for thousands of years (Syroechkovskii, 1995, 178-189). Caribou herds still range across much of Alaska and Canada with some herds numbering in the hundreds of thousands, but caribou have never been domesticated.

No one is sure when reindeer were first domesticated, the only member of the deer family that has been (Clutton-Brock, 1999, 164; Geist, 1998, 315). Mirov's review of earlier literature suggests that domestication may have arisen independently in more than one region of Eurasia (Mirov, 1945, 393). Reindeer were successfully domesticated because they exhibit behaviors that were easily modified to be of benefit to humans. They are generalists in their dietary preferences, eating a wide variety of forages, and grow quickly to slaughter weight. Most deer species become nervous very quickly and are programmed for instant flight when they perceive a threat. Reindeer are much slower to become nervous, form tight herds and stand their ground when threatened, and only flee when absolutely necessary. Although reindeer and caribou are genetically similar, years of domestication have created some distinct differences between them. Traits that vary due to domestication and artificial selection include body size and proportion and coat color, as well as the timing of calving (Geist, 1998).

REINDEER BIOLOGY AND BEHAVIOR

While many may have a mental picture of reindeer as lithe and graceful animals flying through the air with Santa's sleigh in tow, in reality they are quite solid, blocky animals (Hadwen & Palmer, 1922, 5). In contrast with other members of the cervid family, the males are generally called bulls and the females cows, rather than bucks and does, and the castrated animals are called steers. The young are sometimes called fawns but more commonly, calves. Reindeer bodyweight varies considerably throughout the year due to the availability of food sources, their reproductive behavior pattern, and other environmental factors such as insect pests. In a 15-year study of reindeer on the Seward Peninsula, body weight of adult reindeer aged four years and older ranged between 165-230 lbs. for cows and 220-290 lbs. for bulls, depending on the season (Finstad & Pritchard, 2000). Unpublished data collected by Finstad and colleagues show that adult females measure around 40 inches at the top of the shoulder, while adult males measure around 48 inches.

The reindeer's coat varies in color. The legs and the face are dark, while the body shades from brownish grey to creamy white on the shoulders, neck and belly. The hair is also lighter around the tail and down the back of the hind legs. Bulls have a substantial white mane, which hangs down from the base of the neck. For caribou, the light to dark variation in coat color provides effective camouflage. In domesticated reindeer, human selection for coat color has created much more variability; some animals have white coats with dark spots, while others may be pure white. The presence of some white animals makes it easier for the herders to locate their herds in summer. The native peoples of northwestern Alaska eagerly traded with Siberian natives for reindeer hides to make parkas or sleeping mats, even though caribou hides were locally available. Artificial selection for white or spotted coats may lead to a genetic syndrome known as parrot jaw, characterized by jaw deformities and albino coloring (Renecker & Blake, 1992).

Rangifer is the only species of deer in which both males and females produce antlers. Growing antlers are covered with a furry skin called velvet, which is sloughed off as the antlers harden. Antlers generally have several tines, including one that grows forward over the middle of the face. The function of this tine is not known. It is sometimes called the "shovel," but it is clear that it is not used to scrape away snow to allow winter grazing (Berger, 2000, 33). Antler growth in females likely evolved from a need to defend winter feeding craters that they dig in the snow. Reindeer calves have antler buds by the time they are a month old, which develop to wickedly pointed antlers by winter. Males drop their antlers in November or December, after the fall breeding season, while calves and pregnant females retain their antlers until spring. Because they retain their antlers during the winter, calves and pregnant females are dominant over the bald-headed males at feeding sites.

Adaptation to Cold

Reindeer possess several special characteristics that evolved in response to living in a snowy environment. Although Rudolph the Red-nosed Reindeer's shnozz was reportedly very shiny, reindeer actually have hairy muzzles as protection while foraging in snow.

Also, reindeer snouts have an extensive network of turbinate bones that preheats incoming air and acts as a condenser that retains warm moisture-laden air leaving the lungs. One does not see a reindeer's breath in the cold winter air as with humans. In winter snow is the primary source of metabolic water, but it takes considerable energy to thaw and raise the resulting water to body temperature. To conserve energy in a cold environment, reindeer have water-conserving adaptations very much like those of desert animals. Water is recovered from waste in the large intestine, so winter fecal pellets are hard and dry compared to summer fecal patties. Their coats have a thick dense underlayer and hollow guard hairs that trap air, helping to keep the animal warm as well as buoyant during lake and river crossings. Their legs are only lightly covered with hair, but their circulatory system is designed to enable their legs to withstand the cold without drawing heat from their bodies. They have relatively large hooves that function somewhat like snowshoes, enabling travel over boggy tundra in the summer and over snow in winter. Reindeer use their hooves to dig through deep, dense snow to graze in winter. Another interesting characteristic is the clicking noise that reindeer (and caribou) make when they are walking or running. The sound is due to tendons stretching over the sesamoid bones of the feet (Shackleton and Cowan, 1999, 167) and is believed to serve as a mechanism for keeping the herd together (Clutton-Brock, 1999, 161).

Nutrition and Diet

Reindeer are ruminants, grazers rather than browsers, and are highly adapted to the tundra and taiga ecosystems in which they have evolved. Alaskan reindeer are less migratory than caribou and demonstrate strong site fidelity which may lead to overgrazing of feeding areas (Finstad, Kielland, & Schneider, 2006). Composition of forage species across reindeer habitat and in the diets of reindeer varies significantly throughout the year. In Alaska, there are common seasonal shifts from primarily lichen in the spring and winter to willows, sedges and horsetail during the summer months and then back to lichens during fall and winter (Finstad, 2008). Reindeer particularly favor lichens among the *Cetraria*, *Cladina* and *Cladonia* spp, known as reindeer moss. Reindeer will consume a wide variety of plants but, at the same time, reindeer on the Seward Peninsula appear to be very selective both temporally and spatially in what they eat. For this reason, reindeer must be moved from one grazing area to another during the season.

Reproduction and Breeding

Reindeer cows exhibit seasonal polyestrus, coming into estrus in the fall. The estrous cycle is 21 days, with estrus itself extremely short, ranging from 1-3 hours (Shipka & Rowell, 2007, 2). It is not known when in the estrus cycle reindeer actually ovulate or when they mate in relation to the onset of estrus. As in other deer species, bulls become extremely aggressive while gathering females and defending their harems from other males during the rut. The rut is the term for the intense period of fall breeding activity; in addition to behavioral changes, rutting males exhibit physical changes, such as marked

swelling in the neck and testicles. Reproductive bulls may lose up to 30% of their body weight during the rut, because of reduced time spent feeding, and often go into the winter in poor body condition (Finstad & Prichard, 2000). The gestation period in the reindeer has not been clearly established, but is thought to range from 6.5 to 8 months. Unlike other members of the deer family, *Rangifer* cows give birth to only one calf. Alaskan reindeer calves weigh between 12-17 lbs. at birth. Calving begins in April, when it is still very cold in Alaska, and calves are born with very dark coats that absorb warmth from the sun. The calving period of the herd is quite synchronous and short, lasting only about a month. This characteristic is believed to reduce the loss of calves by "swamping" predators during a short time period. Common predators in Alaska include grizzly bears, wolverines and red foxes. Reindeer milk is very high in fat and protein relative to other domestic animals (Holand, Gjostein, & Nieminen, 2006). Because a cow is nursing a single calf, calves grow very fast, often gaining a pound a day (Finstad & Prichard, 2000) (see Figure 2). Female reindeer may breed in their first fall, when they are approximately five months old, if they are in good body condition (Prichard, Finstad, & Shain, 1999). On the Seward Peninsula, cows live and are reproductive up to about 12 years of age, but bulls older than 6 years are rarely seen because of the extreme stress of the rut.

Pests and Diseases

Reindeer are the victims of some nasty parasites, both external and internal. The warble fly lays its eggs on hair shafts. Larvae burrow into the hide, most commonly in the rump area, boring a small hole in the skin so that they can breathe as they grow toward pupation. The holes render the hide useless for commercial sale. Another very uncomfortable parasite, the nasal bot, is related to and acts very much like the warble fly except the eggs are deposited inside the nose and the larvae live on body fluids inside the nasal passages. Reindeer are beset by a variety of intestinal parasites, including roundworms, lung worms and tapeworms. Like sheep, cattle and pigs, reindeer are susceptible to brucellosis (causal organism is *Brucella suis*), which may cause abortion or retained placentas in cows and lameness in both cows and bulls. Reindeer are also plagued by mosquitoes and blackflies, a complaint shared by tourists and Alaskan residents during the summer. These insects cause the animals to be extremely restless, and they lose weight because they won't graze. Reindeer try to avoid mosquitoes by migrating to wind-blown upland areas or the shoreline of lakes and ocean. One reason that reindeer may be so productive on the Seward Peninsula is that the relatively high ratio of shoreline and mountainous terrain provides numerous insect relief areas. Reindeer can easily move from one insect relief site to another without losing grazing time.

THE ALASKA REINDEER PROJECT: HISTORY AND CHRONOLOGY

All of the reindeer in Alaska originate from imported animals. Only a brief synopsis of some key events in the Reindeer Project's history follows; accounts have been published by Ellanna and Sherrod (2004), Olson (1969), Postell (1990), and Stern, Arobio, Naylor,



FIGURE 2 Reindeer cow with newborn calf. Photo by Greg Finstad. Used with permission.

and Thomas (1980). The report by Stern et al. (1980) is the most detailed report of the earlier history and is frequently cited by other researchers. In 1867, the vast territory of Alaska (more 586,000 square miles) was purchased from Russia by William Seward, U.S. Secretary of State, for the sum of \$7.2 million. At the time, years before the discovery of gold and then the North Slope oil, this purchase was widely known as Seward's Icebox or Seward's Folly. Before the arrival of people from other regions, Alaska was inhabited by several different cultural groups: Eskimos, Indians and Aleuts, now known collectively as Alaska Natives. Alaska derives from an Aleut word "Alyeska," meaning the "Great Land." These native peoples belong to the hunter-gatherer tradition, relying on the availability of land and marine mammals as food

sources, as well as on abundant salmon runs and native berries. Today, much of Alaska is still off the road system, and Alaska Natives living in the many small villages throughout the state depend on subsistence activities for much of their food supply.

As people from “Outside” encroached on Alaska, many changes took place for the Inupiat and Yupik people occupying the northwestern region. On the Seward Peninsula, the caribou disappeared by about 1880 because the introduction of firearms made hunting easier. For a time, native people shifted their hunting to sea mammals and to fishing, but the huge expansion in the American whaling industry in the mid-1800s led to a decrease in whale numbers. Over-hunting of other marine mammals to feed whaling crews wintering in Alaska further depleted their subsistence food sources. Sheldon Jackson, an ordained Presbyterian minister who had established a mission on the Seward Peninsula, also served as the first U.S. General Agent for Education for Alaska from 1885 until 1907. A biography by Robert Stewart, published a year before Jackson’s death, describes his life (Stewart, 1908). Jackson was deeply concerned about the survival of the Inupiat and Yupik people and providing them with a way of surviving in a changing Alaska. Acting on the suggestion of Captain William Healy, a maritime revenue services captain, and others familiar with domesticated reindeer herding in Siberia, Jackson was anxious to import reindeer into Alaska. Convinced of the intrinsic value of this project to help the native population, he tenaciously pursued support from the federal government, as well as raising funds from private sources to buy Siberian reindeer. Jackson’s underlying motives for introducing reindeer to Alaska have since been questioned because of his views on evangelization and assimilation of indigenous people (Ellana & Sherrod, 2004; Postell, 1990).

In 1891, a shipment of 16 animals was delivered to Amaknak Island in the Aleutian Islands chain, proving that reindeer could be safely transported by ship. In 1892, a second consignment of 171 animals arrived at Port Clarence on the Seward Peninsula. Jackson established the Teller Reindeer Station not far from Port Clarence. In addition to the reindeer, reindeer herders from Siberia were also brought in to teach Alaska Natives reindeer herding and management techniques. This aspect of the project was not successful because of tensions between these different cultural groups who were long-standing trading partners. In 1894, William Kjellman, a Norwegian with reindeer herding experience, was hired to manage the Teller Station. After the failure with the Siberian herders, Kjellman was given the task of seeking Saami herders from Norway and Finland to work with Alaska Natives. Jackson went on to establish more reindeer stations and distribute reindeer to missions on the Seward Peninsula and in other areas of northwestern Alaska. Local schools also became centers for reindeer herding operations, and teachers were charged with overseeing reindeer herding in addition to their teaching duties. Alaska Native men and boys were encouraged to become apprentices in the reindeer-herding project. They received room and board at the reindeer stations during their apprenticeship, as well a certain number of reindeer for each year spent in the program, with the goal of starting their own herds.

Despite the reluctance of Siberian herders to part with live animals, several more shipments of reindeer were purchased up until 1902, when the Russian Imperial Government prohibited further exports. After 1902, expansion in Alaskan reindeer numbers was due solely to natural increase. Missions and Saami herders owned reindeer or were loaned them by the Bureau of Education. The total number of reindeer owned by

Alaska Natives gradually increased, but individual herds were often too small to provide an adequate income (Finstad et al., 2006). Sheldon Jackson was moved out of his government post in 1907 and the U.S. Reindeer Service was formed within the Bureau of Education, with school superintendents managing reindeer distribution.

In 1914, the Lomen family, who had moved to Alaska from Seattle during the late 1890's gold rush, saw an opportunity to enter the fledgling reindeer industry. They purchased thousands of animals from the missions and Saami herders, who were more interested in becoming gold miners than continuing to herd reindeer. For the next 25 years, the Lomens dominated the Alaska reindeer industry, building slaughtering and storage facilities and purchasing ships to send reindeer carcasses to markets outside Alaska. Carl Lomen chronicled the family's experiences in his book *Fifty Years in Alaska* (Lomen, 1954).

Although the original purpose of importing reindeer to Alaska was to provide an economic opportunity for Alaska Natives, they were given very little control and only allocated small numbers of animals. The Lomens faced challenges as well, including the Great Depression and growing difficulty in marketing reindeer meat outside Alaska. Tensions mounted between the native herders and the Lomens, finally resulting in the passage of the Reindeer Industry Act (25 U.S.C. §§500-500n; PL 75-413) in 1937, intended to bolster participation of Alaska Natives in reindeer herding (For more information on legal interpretation of the Reindeer Industry Act and other legislation affecting Alaska Native rights, see Dillingham, 1999). The Reindeer Act was strongly supported by cattle producers in northwestern states, because they felt threatened by competition from the sale of reindeer meat (Beach, 1985). After the passage of the Reindeer Act, all reindeer owned by non-Natives were purchased by the federal government for the purpose of loaning them to Alaska Natives to start or expand reindeer herds.

The Reindeer Service was transferred between several different agencies, finally ending in the Alaska Division of the Office of Indian Affairs, later the Bureau of Indian Affairs (BIA), in 1937 (Stern et al., 1980, 60). Because of the trust relationship between the federal government and Native Americans, reindeer were held in trust by the BIA for Alaska Native herders, rather than actually owned by them (Dillingham, 1999). Alaska became the 49th state of the Union in 1959, but control of its reindeer remained with the federal government. In 1968, the State of Alaska, the BIA and the Bureau of Land Management (BLM) agreed that the BLM would manage the reindeer ranges, while the BIA remained in charge of managing the reindeer herd (Stern et al., 1980, 95). In 1971, the Northwest Alaska Reindeer Herders Association (established in 1964) was incorporated as the Reindeer Herders Association (RHA), a cooperative of Seward Peninsula reindeer herders (Stern et al., 1980, 98). The aims of the RHA, as stated on its website, are to "provide assistance to its twenty-one members in the development of a viable reindeer industry, to enhance the economic base for rural Alaska and to improve the management of the herds" ("Reindeer Herders Association," 2006, ¶1). The Association holds an annual meeting in March, to discuss various issues involved in reindeer herding. Following the loss of most government-owned reindeer due to migrating caribou herds (Reindeer in Alaska, 2006), the BIA relinquished its trust responsibility so herders now have ownership of their reindeer.

REINDEER PRODUCTION AND MANAGEMENT

Reindeer can “fulfill all the roles that in warmer climates are undertaken by cattle” (Clutton-Brock, 1999, 164).

Reindeer Products

In Alaska, the two most important commercial reindeer products are meat and velvet antler. Data compiled by the Alaska Field Office of the National Agricultural Statistical Service reported sales totaling \$9.6 million for reindeer meat and \$10.3 million for velvet antler between 1897 and 2003. Most of the reindeer meat is sold locally in villages on the Seward Peninsula. Reindeer meat “is attractive to the health conscious consumer for its low fat content, favorable fat composition, and high mineral content” (Wiklund, 2006, 19). For the same-sized serving, reindeer meat is lower in calories and fat than beef (Swanson & Penfold, 1991). Meat from grazing animals tends to be higher in polyunsaturated fats than meat from hay and grain-fed animals but also tends to have a gamier “reindeer” flavor. Because there is little intramuscular fat (marbling), reindeer meat is dryer than beef. In rural Alaska, it is commonly used as stew meat but can also be ground (Wiklund, Finstad, Johansson, Aguiar, & Bechtel, 2008). Dishes featuring reindeer sausage are popular on the menus in Alaskan restaurants. Reindeer meat can be preserved by smoking and drying (Wiklund, 2006, 21). As long ago as 1929, the Bureau of Home Economics in the U.S. Department of Agriculture (USDA), recognizing the growing interest in reindeer meat at the time, published a booklet of recipes featuring a variety of cuts (Stanley, 1929).

Velvet antler is highly sought after in some Asian countries as an elixir for balancing the body’s yin and yang and for its reputation for treating a variety of ailments, including arthritis. “Contrary to popular belief, it is not used as an aphrodisiac” (Grover & Renecker, 1994, 3). The largest quantities of velvet antler come from bulls, but steer antlers regrow after harvesting, yielding two cuttings per season. Velvet antler grade is partly based on antler size and must be collected May through June, before the bull antlers begin to calcify in July. In Alaska, velvet antler sales gained traction in the early 1970s because of increased demand. Prices have been as high as \$30-50 per pound in the past, but by 2001 were down to \$10-15 (Rozell, 2001). Reindeer hides are sold locally for making clothing such as parkas and mukluks, boots that are worn by the Inupiat and Yupiks.

Reindeer are used by some cultural groups in Eurasia for milk production and as draft animals. In the early days, they were used on Alaskan mail runs because they were easier to feed than sled dogs. During the gold rush around Nome beginning in 1898, reindeer were very important in pulling sleds to transport all kinds of goods to the mining camps. They are no longer used for transportation in Alaska.

Herding Systems and Reindeer Ownership

Methods for herding Alaska’s reindeer have been through several changes since the early 1890s. The Siberian and Saami herders taught their Alaskan apprentices the close herding

methods that they had grown up with. In close herding, the herders live and travel with the animals, keeping them somewhat contained. Beginning in 1915, the Reindeer Service began promoting a variety of different strategies for managing the reindeer herds, including the adoption of cooperative ownership of reindeer and open range grazing, which were supported by the Lomen family. Herd management consisted of allowing reindeer to graze freely across the Seward Peninsula in an open range system, with no delineation of range areas for use by particular herds. Financial returns to individual owners were calculated on the basis of the number of animals owned. This caused many problems, because of the difficulty in identifying which animals belonged to particular individuals. The Lomens took advantage of the native herders by earmarking unmarked animals and by charging grazing fees. Practices like these contributed to the tensions that led to the passing of the 1937 Reindeer Act.

The Reindeer Act re-established private ownership and limited individual reindeer herds limited to defined grazing areas described as “ranges.” From 1962 until the early 1980s, the BLM issued reindeer grazing permits for allotments made up of state, federal and village corporation lands. At that time, both the State of Alaska and the National Park Service received jurisdiction for some of the land, although the BLM manages the permitting system for all three groups. The allotments are approximately 400,000 hectares in size (Finstad et al., 2006, 6). No grazing fees are charged, but herders must pay a filing fee of \$10 with an application for an allotment. Permits last for 10 years. The granting of a grazing permit requires the herder to develop a grazing management plan, with approval from the National Resources Conservation Service (NRCS) and following guidelines in the *National Range and Pasture Handbook* (NRCS, 2009).

Animal Husbandry

Today, Alaska’s reindeer herds are managed extensively. Reindeer herders generally live some distance from their herding range and visit their herds only a few times a year. Timing of the visits (handlings) is dictated by weather conditions and when it is possible to travel over ice and snow or by boat. Snowmachines are a huge benefit to herders, because they provide quicker and easier access to the herd than either skiing or dog sledding. The major events in the herding calendar are the roundups. Alaskan reindeer herding has traditionally been a family-based activity and members of the herder’s extended family help at the roundups. Each herder has access to a reindeer corral, carefully designed to take advantage of reindeer behavioral traits in order to keep stress levels for the animals to a minimum. Costs associated with handlings include supplies, fuel for snowmachines and all-terrain vehicles, and labor costs. Additional costs associated with roundups may include repairs to cabins and corrals on the range and expenses for helicopters and other air charter services.

Reindeer bulls go into rut in August. The mating period in the herd is very short, lasting only 2-3 weeks. Cows calve in early April to early May. The herds are rounded up and corralled between the end of May and early July. Calves and mavericks (adult animals that have never been corralled) are earmarked. Branding is not successful with reindeer because of their thick coats, so an ear-notching pattern specific to each herder is used to designate ownership. Current management practice includes castrating excess

males to reach a ratio of one bull for every 15 to 20 cows in the herd. Herd information, such as age and sex and body condition, is recorded (Finstad, Bader, & Pritchard, 2002) and velvet antler is harvested. Veterinary care is an important part of the roundup. Ivermectin, an anthelmintic which is FDA approved for use in reindeer, is administered to control flies, bots and worms. Adult animals are vaccinated against brucellosis.

Additional roundups, often occurring in January, are held for slaughtering, which must be done when the weather is cold enough to freeze the carcasses in the field. Regulations for field slaughter are administered by the state of Alaska. "Field slaughtered reindeer meat can be marketed locally provided animals are slaughtered on snow when ambient temperature is below 0°C, carcasses are allowed to freeze and the meat is not thawed until in the hands of the consumer" (Wiklund et al., 2008, 185). Reindeer meat sold for the local market typically comes from steers about two years old or older. Steer carcasses dress out at about 50-60% of bodyweight (Wiklund et al., 2008, 187). Other animals may also be slaughtered at roundup to cull the herd.

REINDEER NUMBERS IN ALASKA

Following the importing of Siberian reindeer in the early 1890s, Alaskan reindeer numbers began to increase. After the discovery of gold, first in the Yukon Territory and then around Nome on the Seward Peninsula, reindeer numbers grew rapidly due to the demands for transportation and a red meat supply. By 1902, there were more than 5,000 reindeer, including the original 1,280 animals imported from Russia. The entry of the Lomen family into the reindeer business in 1914 further increased numbers. By the late 1920s and early 1930s, reindeer herds were present in a large area of northwestern Alaska, numbering approximately 640,000 animals with around 130,000 on the Seward Peninsula. Beginning in 1932, reindeer numbers declined steeply, dropping to 250,000 by 1940. By 1951, the total had decreased to 27,000, with only 6,500 reindeer on the Seward Peninsula. From then on until 1977, the last year for which Stern et al. (1980, 102-103) reported data, the total population fluctuated between 25,000 and 50,000 animals. Today, however, the most recent available figures show that, in 2007, the reindeer population numbered only 15,000 animals (USDA, 2008, 29). Most of them are located on the Seward Peninsula.

CHALLENGES FOR ALASKA'S REINDEER INDUSTRY

From its beginning, Alaska's reindeer industry has faced many challenges (Schneider, Kielland, & Finstad, 2005). Many Alaska Natives preferred the traditional ways of hunting and subsistence and the pattern of their village life to the isolated life of the reindeer herders. Even the introduction of extensive herding, which allowed herders to live in their villages, and the advent of more modern equipment, such as snowmachines, did not add appeal. Historically, poor herd management practices, including overstocking, depleted the range in many areas so that reindeer numbers declined, because lichens are particularly sensitive to overgrazing and may take years to regrow. The distance of the reindeer herds from markets, the cost of transportation, and the lack

of infrastructure—including federally-inspected slaughtering, processing and cold storage facilities—still present obstacles for the viability of the industry. Reduced demand for velvet antler has also affected the economics of reindeer production.

A major problem for reindeer herders is the intermingling of reindeer with migrating caribou. There are approximately 30 distinct caribou herds in Alaska (Bartlett, 2003). These herds have separate ranges, but their migratory paths and calving grounds may overlap. In the northwest of Alaska there are four herds; the largest is the Western Arctic Caribou Herd. This herd has dramatically impacted the present day reindeer industry. Since the mid-1970s, herd numbers have increased substantially and the herd has changed wintering areas. The Alaska Department of Fish and Game (2007, 174) reported that “since 1996, much of the herd has been wintering on the eastern half of the Seward Peninsula,” much further into the reindeer ranges. Changes in the caribou migration pattern may be due to the recovery of the Seward Peninsula vegetation from previous overgrazing by reindeer. Between 1991 and 1999, several reindeer herds were substantially depleted and some completely wiped out when they joined caribou herds migrating to their spring calving grounds (Finstad et al., 2002). Domesticated reindeer are too far removed from their wild heritage to survive well without human stewardship. Satellite telemetry studies show that most reindeer that join the caribou perish due to starvation, predation or human hunting. Reindeer herders have suffered substantial economic losses in recent years because of the loss of their reindeer.

REINDEER RESEARCH

The University of Alaska Fairbanks (UAF) is actively engaged in reindeer research. UAF’s Institute of Arctic Biology owns a small reindeer herd located at the Large Animal Research Station (LARS) in Fairbanks. Research programs at LARS emphasize reproductive and nutritional physiology and behavior of reindeer, as well as caribou and musk ox. Most animals at LARS originated from live shipments from the Seward Peninsula during the early 1980s. Tours of LARS are very popular with summer visitors (UAF LARS, n.d.).

UAF’s School of Natural Resources and Agricultural Sciences has also conducted reindeer research for many years. A formal Reindeer Research Program (RRP) was established in 1981 (UAF RRP, 2008). Dr. Robert Dietrich, a veterinarian, was appointed as the first program manager. At that time, most of the Reindeer Research Program’s work was conducted by collaborating with reindeer herders on the Seward Peninsula. In 1997, the program established a reindeer herd at the Agricultural and Forestry Experiment Station facility in Fairbanks by bringing 17 female calves from the Seward Peninsula (Fitzgerald, 2002, 6).

The RRP focuses primarily on applied reindeer research both in Fairbanks and on the Seward Peninsula. Investigations by RRP using a captive herd in Fairbanks include nutrient requirements and animal performance, ration formulation and development of supplementary feeds, and pasture management. On the Seward Peninsula, the RRP collaborates with reindeer producers to improve range management and husbandry techniques, hygienic slaughtering and meat processing, and design of handling facilities and equipment such as corrals and crushes. Field programs incorporate satellite telemetry

and radio collars to track both reindeer herds and migrating caribou to better understand their migration and grazing patterns in relation to use of the reindeer range. RRP has also developed computer programs for keeping herd records, to aid in breeding and culling decisions.

While many scholarly journals publish peer-reviewed reindeer research, *Rangifer* (2008) is a common venue for much of UAF's reindeer research findings. Sponsored by the Nordic Council for Reindeer Husbandry, *Rangifer* focuses on "reindeer and other arctic ungulates." It is an open access journal from volume 28 and also provides online access to back issues.

The Reindeer Research Program has a strong commitment to outreach, regularly visiting schools in the Fairbanks area. The educational outreach program was established in 1998 after Greg Finstad accepted his wife's invitation to bring a live reindeer to visit her kindergarten class. Children in the Fairbanks area look forward with excitement to seeing the reindeer, especially around Christmas time. As another fun activity, each spring they are invited to help name the reindeer calves by sending in their suggestions to the RRP website. To support outreach efforts, the program's staff have produced a K-12 curriculum guide for teachers throughout the state to educate Alaskan children about reindeer (Bucki, 2004). A new effort is a 4-H program with six reindeer calves for exhibition at the 2009 Fairbanks-North Star Borough Fair and sale at auction, just like other animals raised by 4-Hers all across the country.

Another aspect of Alaskan reindeer research is the archiving of traditional reindeer herding knowledge through an extensive collection of interviews with Alaska Native reindeer herders, conducted by the Oral History Program at UAF's Elmer E. Rasmuson Library. These recordings are listed in the Library's online catalog (<http://library.uaf.edu>) and many are available online through the Oral History Program's Project Jukebox website (UAF Project Jukebox, n.d.). These interviews present a fascinating picture of reindeer herding life.

FUTURE OF ALASKA'S REINDEER INDUSTRY

Alaska produces only 5% of its food supply, leaving residents very vulnerable to outside factors such as energy costs and product demand in other markets. Reindeer are ideally suited to the climate and vegetation of the Seward Peninsula, and reindeer herding represents an as yet unrealized opportunity for providing Alaska with a sustainable supply of red meat. Recent losses to migrating caribou herds have left only three commercially viable reindeer herds (Alaska Department of Fish and Game, 2007, 197), but reindeer numbers can rebound quickly under good conditions as shown by the huge increases during the early 1900s. With the adoption of animal management strategies promoted by the Reindeer Research Program—such as closer confinement and supplementary feeding at calving time (Finstad, 2007)—losses to caribou can be reduced. With careful management of the reindeer ranges, the reindeer industry has the potential to be a major economic driver for Alaska's rural communities.

REINDEER IN THE “LOWER 48” AND CANADA

Reindeer ownership in other U.S. states presents a very different picture from the Alaskan situation. Reindeer in the “Lower 48” originate from Alaskan stock. Within Alaska, only Alaska Natives can own Alaskan reindeer, as decreed by the 1937 Reindeer Act. People outside Alaska may purchase them from Alaska Natives under conditions as allowed by the Reindeer Act. Canada is also a source of reindeer for the Lower 48. Canadian reindeer, however, also trace back to Alaskan reindeer, many sold by the Lomen family to the King of Great Britain and driven overland from northwestern Alaska to the Mackenzie River delta in the North West Territory at the end of 1929. The reason for the King’s purchase was the same as Sheldon Jackson’s: the establishment of a reindeer industry to provide food and income for native people. An account of the drive (which was planned to take a year and a half and ended up taking five years) was written by Max Miller (1935). A more recent book recalls the first-hand experiences of the families who were herders in Canada’s now virtually extinct reindeer herding industry (Hart, 2001).

Gordon Poest, author of *Raising reindeer for pleasure and profit*, first published in 1998, started raising reindeer after rearing an orphaned whitetail fawn (Poest, 2001). His book provides a management guide for other enthusiasts who are raising reindeer in the Lower 48 and Canada. Poest also served a term as secretary of the Reindeer Owners and Breeders Association (ROBA), which was founded in 1992. According to Kyle Wilson, owner of Rocky Hill Reindeer in Tennessee and current vice-president of ROBA, there are approximately 250 members of the Association (K. Wilson, telephone interview, June 19, 2009). Mr. Wilson, who has owned reindeer for about ten years, also represents ROBA interests at meetings of the USDA and the United States Animal Health Association (USAHA). There are ROBA members in some 25 states, stretching from Wisconsin to Florida and Connecticut to Oregon, as well as in Canada and several other countries. ROBA’s goals, as stated on its website, are to supply “the membership with reindeer education, research, and conservation” and to “enhance the abilities of members to maintain health herds and reindeer business operations” (ROBA, n.d.). ROBA has a wide variety of members with differing interests. Many owners have not had reindeer very long and are still learning husbandry techniques. The Association provides a forum for them to learn from each other about the many aspects involved in owning reindeer, including feeding and nutrition, health and diseases, fencing and housing, and rules and regulations. As reindeer are raised in so many different regions of the country, there are many different answers to management issues, depending on local conditions. For example, Mr. Wilson pointed out that in the rocky area where he lives, hoof trimming is never needed but it is a factor for reindeer raised on sandy soils in other areas of the country. He also stated that what to feed reindeer is one of the most difficult issues to deal with. In the Lower 48, reindeer are fed hay, grain, and commercial pellets; getting the proportions correct may take some time to work out and is affected by what types of feeds are available locally.

In some U.S. states, reindeer are classed as domestic animals, while in others they are still regarded as “exotic” animals with respect to laws and regulations. Differing state agencies may have jurisdiction over reindeer, including Agriculture, Fisheries and Wildlife or Fish and Game Commissions and Natural Resources. To travel across state

lines, reindeer must be from herds certified free of diseases such as tuberculosis (TB), brucellosis, and chronic wasting disease (CWD). None of these diseases have been reported from reindeer in the Lower 48, although brucellosis has occurred in reindeer in Alaska. Mr. Wilson mentioned that the TB test currently used is problematic, as it is designed for cattle and may cause false positives in reindeer. ROBA has been working with the National Veterinary Service Laboratory in Ames, Iowa to develop a more sensitive test. ROBA publishes a membership newsletter and holds an annual meeting in a different location each year so that members can attend presentations by reindeer researchers and exchange information with each other. In addition to ROBA, there are also active reindeer associations in the Canadian provinces of Alberta ("Alberta Reindeer Association," 2008) and Saskatchewan ("Saskatchewan Reindeer Association," n.d.). The Deer, Elk and Reindeer Farmers' Network (n.d.), based in Alberta, also publishes information helpful to reindeer owners.

Mr. Wilson said that there is currently no accurate census of the total number of reindeer in the Lower 48, but he believes that there are probably around 2,000 animals. Many reindeer owners have only a small number of animals and are considered hobbyists, although others may own up to 60 or 70 reindeer. There is no commercial reindeer meat industry in the Lower 48. The chief sources of income for reindeer owners are derived from breeding and selling live animals, renting and leasing reindeer for commercial display and to animal parks and zoos, farm tours, and making jewelry and other products from dry antler. Interestingly, the Lomen family, looking for new business opportunities, sent reindeer to the Lower 48 beginning in 1926 for use in Christmas displays in various cities around the country (Postell, 1990, 80). According to Mr. Wilson, some Christmas tree farmers may either own or rent reindeer to attract customers and have found that this investment is well worth the cost. Mr. Wilson also noted that many reindeer owners simply enjoy owning reindeer and regard their animals as pets.

CONCLUSION

The reindeer is an extraordinary animal. For thousands of years, reindeer have provided humans in regions of the circumpolar north with a source of food, clothing, shelter, and transportation. In Alaska, the practice of reindeer herding has been in existence for less than 120 years and, while there have been numerous challenges, the reindeer represents the state's best chance for establishing a thriving meat industry. The reindeer is also very adaptable, shown by its ability to adjust to the variety of climates and conditions throughout the Lower 48.

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