

PERSPECTIVE

The history of the musk ox farm in Bardu, Arctic Norway

Paul F. Wilkinson 

St-Paul-d'Abbotsford, Québec, Canada

Abstract

In 1969, a musk ox (*Ovibos moschatus*) farm was started in Bardu, northern Norway, with 25 calves captured in Greenland. John J. Teal Jr., a professor at the University of Alaska, was the primus motor of the initiative, which had the aims of domesticating the musk oxen, distributing the domesticated animals to local farms, exhibiting the animals commercially and providing local knitters with the valuable underwool (qiviut) and, thereby, an income-generating activity. Teal withdrew from the project in 1973. The farm operated until 1975, when a bull, one of three escapees, killed a local hunter. Little has been published in English about the Bardu farm, which was one of only six large-scale musk ox farms ever established, and the only one outside North America. This Perspective piece describes the emergence of the idea of domesticating musk oxen in early 20th century North America; capturing the founding stock; constructing and operating the farm; the effort to produce qiviut handknits; and the circumstances leading to the farm's closure. I conclude that the Bardu farm achieved none of its animal husbandry or socio-economic goals. The farm's failure can be attributed to a chronic lack of money; the absence of a clear description of its purposes and a plan to achieve them; the failure to tame the musk oxen and to contain the rutting bulls; and other causes. On a positive note, the University of Tromsø's research on the surviving animals after the farm closed yielded data relevant to free-living and farm-raised musk oxen.

Introduction

Western animal husbandry was well established in North America by the start of the 20th century, but there was still interest in domesticating new species of animals and improving existing domesticates. Harvard professor Nathaniel Southgate Shaler wrote a book on domesticated animals (Shaler 1904), in which he recommended domesticating the platypus (*Ornithorhynchus anatinus*), the kangaroo (*Macropus* spp.), the musk ox (*Ovibos moschatus*), the red fox (*Vulpes vulpes*), the polar bear (*Ursus maritimus*), the black bear (*U. americanus*), the beaver (*Castor canadensis*) and various seal species. Several explorers had suggested domesticating musk oxen in the three centuries, following their sighting by Nicolas Jéréme (Wilkinson 1974), but Shaler was the first specialist in animal sciences to suggest doing so.

Arctic explorer Vilhjalmur Stefansson conceived the idea of domesticating musk oxen during the 1913–18 Canadian Arctic Expedition (Stefansson 1922). Starting in the 1940s, Stefansson pursued his interest in domesticating musk oxen to improve the economic viability of hill farms in New England through two not-for-profit

organizations in Vermont. John J. Teal Jr. became involved with Stefansson in 1949. Teal's interest gradually extended to creating village musk ox farms in the circumpolar North and using the musk ox's underwool, which he called *qiviut* after an Inuit dictionary entry (Schultz-Lorentzen 1927), as the raw material for a domestic handknitting industry offering rural, predominantly Native, women an opportunity to earn essential income in a manner compatible with their other cultural and economic responsibilities. Teal established a large-scale musk ox farm at the University of Alaska at Fairbanks (the site of the university was called College at the time) in 1964 with funding from the W.K. Kellogg Foundation. He eventually abandoned his plan for small, Native-owned and -operated village farms in favour of maintaining a single herd and distributing the qiviut to villages with knitters and moved all the animals to Unalakleet (63°88'N, 160°79'W) in 1986 and 1987.

In 1970, Teal was instrumental in incorporating Oomingmak Musk Ox Producers Cooperative under Alaska law, most of the members and managers of which were Inuit women knitters, to oversee the designing, production and marketing of qiviut garments. Oomingmak

Keywords

Ovibos moschatus; wildlife farming; qiviut; John J. Teal Jr.; Vilhjalmur Stefansson; Alfred Henningsen

Correspondence

Paul F. Wilkinson, 1108 rue Principale est, St-Paul-d'Abbotsford, Québec JOE 1A0, Canada. E-mail: pfw@wilkinson.ca

Abbreviation

INAR: Institute of Northern Agricultural Research



Fig. 1 The approximate locations of some places in the text. (Modified version of a map by copyright-holders Malte Humpert and The Arctic Institute.)

was very successful from the outset. According to Bruce & Robertson (1994) and my 2017 conversation with Mrs Sigrun Robertson, its executive director for many years, Oomingmak held 31 knitting workshops in 23 Alaska villages between 1968 and 2008. The number of active knitters grew to about 100 by 1977 and averaged 165 between 1978 and 2010, with a peak of 206 in 1989 and a low of 127 in 1979. The knitters produced roughly 97 000 garments by 2008, which Oomingmak sold, mainly at retail prices. Oomingmak paid the knitters roughly 6 000 000 USD (2022) over that period.

Teal also helped the Government of Québec to establish a farm at Old Fort Chimo, near Kuujuaq, in northern Québec (58°6'N, 68°23'W), in 1967, but he had little involvement in it thereafter. The government changed policy and, starting in 1973, released the musk oxen into the wild in northern Québec, where they are thriving (Brodeur et al. 2023).

In 1969, Teal assisted the municipality of Bardu, northern Norway, to establish a farm with 25 calves captured in east Greenland (Fig. 1). His involvement in operating the farm was minor and ceased in 1971. The farm was closed in 1976. This article describes the Bardu farm's establishment and operation and evaluates what it achieved. The farm's story is valuable as it was one of only six large-scale musk ox farms ever established and the only one outside of North America. Examining its successes and failures may cast light on the broader issue of domesticating new animal species and the challenges of introducing them to northern economies and cultures, especially since it was started when the rapid growth of Oomingmak Musk Ox Producers Cooperative in Alaska suggested that important socio-economic impacts might quickly be achieved in Norway. The cooperative consisted almost entirely of women and was managed by women, adding to its interest. Teal's attempts to transform the

relationship between musk oxen and humans was a pioneering effort and merits interest in the growing scholarly field of anthrozoology (e.g., Herzog 2010).

North American interest in musk ox domestication and Teal's involvement

Teal was born in New York on 7 February 1921. He earned a Bachelor's degree with a major in anthropology at Harvard in 1944 and a Master's in international relations at Yale in 1946. After conducting research in Alaska and Scandinavia, in 1949, he joined the board of directors of Vermont Animal Research Incorporated, which was renamed Vermont Animal Research Foundation in 1953. (Teal later became a professor at the University of Alaska Fairbanks.) Stefansson and several prominent Vermonters created Vermont Animal Research Incorporated in 1946 to investigate ways to make impoverished hill farms in New England economically viable by domesticating indigenous species such as white-tailed deer (*Odocoileus virginianus*) and beavers (*Castor canadensis*) and by importing and, where needed, domesticating such exotic species as yaks (*Bos grunniens*) and Icelandic horses (*Equus caballus*).

Stefansson (1946) and his colleagues believed that many New England hill farms were largely uneconomic because their sheep needed barns in winter. Under the assumption that musk oxen in temperate areas would not require barns in winter, the first project of Vermont Animal Research Incorporated was to evaluate whether musk oxen could be domesticated. Stefansson had become familiar with musk oxen when he led the Northern Division of the 1913–18 Canadian Arctic Expedition (Cooke & Holland 1978). He mentioned his idea of domesticating them to US Colonel, later President, Theodore Roosevelt and Canadian Prime Minister Robert Borden. Arthur Meighen, Minister of the Interior at the time and later two-time Prime Minister of Canada, arranged for him to address a joint session of the House and the Senate in Ottawa on 6 May 1919 (Sandlos 2007). Two weeks later, at Meighen's recommendation (Diubaldo 1978), Cabinet approved the creation of the Royal Commission upon the Possibilities of the Reindeer & Musk-Ox Industries in the Arctic and Sub-Arctic Regions. Stefansson was a founding member, but he resigned in March 1920 because the recent approval of his application for a grazing lease for reindeer (*Rangifer tarandus*) in southern Baffin Island created a perceived conflict of interest (Rutherford et al. 1922). The Royal Commission's recommendation of a federal experiment to establish a station with some young musk oxen on an Arctic island was not implemented.

Vermont Animal Research Incorporated/Foundation did not consider using domesticated musk oxen to benefit

northern Indigenous peoples. During his travels in the early 1950s, Teal observed musk oxen that had been imported from Greenland to Norway (Lønø 1960). Before their release into the wild, some were held on farms over the winter. He was impressed by how easily they could be tamed and raised in captivity. By 1954, Teal was advocating using domesticated musk oxen for Arctic husbandry as well as on economically marginal farms in the northern US.

Teal's relationship with some of his fellow Vermont Animal Research Incorporated/Foundation directors was strained because of competition about whose farm in Vermont would be used to raise the first musk ox calves captured. Teal insisted that they be raised at his farm, Tunturi, in Huntington, rather than on the farm of one of his fellow directors. The board of the Vermont Animal Research Foundation resolved the issue in February 1954, when it put Teal in charge of the first capture of calves and authorized him to decide where they should go in Vermont. Notwithstanding the foundation's decision in his favour, Teal incorporated INAR, a new not-for-profit entity of which he was in sole control, under Vermont law in December 1954. INAR's articles of association specified that it would conduct research and educational programmes about the domestication of plants and animals adapted or adaptable to the Arctic and Subarctic regions of North America and Greenland with a view to expanding and stabilizing the agricultural economy of those regions and of the mountain regions of the northern US. Teal's 1954–59 notebook (kept at the Rauner Special Collections Library, Dartmouth University) set out his definition of domestication as "the breeding of plants and animals in captivity, the control of that breeding by man, and the development of special types through selection, types which do not occur in a wild state." Teal did not resign from the board of the Vermont Animal Research Foundation board when he created INAR, but the foundation became inactive. He did not appoint Stefansson to INAR's board of directors, but Stefansson became a member of INAR.

Regardless of what domesticated musk oxen were to be used for, and where, there still was no certainty whether large numbers could be raised in captivity over the long term. An experiment was needed. On 29 January 1950, Teal asked the Government of Canada for a permit to capture eight calves on Ellesmere Island and to raise them on a farm in Vermont. The government refused because the chairman of its Interdepartmental Committee on Northern Agriculture believed, based on statements by Teal, that Teal intended to try crossbreeding musk oxen with other species, probably yaks, which, the chairman thought, should be done exclusively by the Canadian Department of Agriculture. Teal submitted a second application, also for eight calves from Ellesmere Island, on 18 October 1951.

The Canadian Advisory Board on Wildlife Protection approved it with the following conditions: no adults were to be killed; no newborn calves were to be captured; a federal representative must accompany the capture; an annual report must be submitted to the Commissioner of the Northwest Territories for 20 years; and the Commissioner would have access to the animals and the data collected from them. Teal conducted two captures, both in the Canadian Thelon Game Sanctuary. He captured one male and two female calves in 1954 and three males and one female in 1955. They went to Tunturi.

Teal's experience at Tunturi convinced him by 1958 that musk oxen could be raised in captivity in large numbers, and that their qiviut was suitable for a handknitting industry. Stefansson's prediction that musk oxen in Vermont would not need barns in winter proved to be correct, but the deaths of several animals, especially calves, at Tunturi from heat prostration demonstrated that they needed an air-conditioned barn in summer.

Teal's conviction about the viability of domesticating musk oxen did not take into account the economics of doing so. My many conversations with Teal and his children between 1968 and 2019 suggest that he used the family's money to cover the operating costs of Tunturi in the 1950s. The musk oxen generated no income at that time. His papers in the Rauner Special Collections Library at Dartmouth College, New Hampshire, contain no financial analyses for the relevant period.

Teal died in August 1982. Raising captive musk oxen in Alaska continued under the auspices of a not-for-profit corporation, Musk Ox Development Corporation, incorporated in October 1984, which closed the Unalakleet farm and brought the animals to Palmer, where they remain. The qiviut from those animals has not benefitted Oomingmak's or other Alaska knitters since 2021, since the corporation decided to have its qiviut spun and products knitted in South America, which caused me to resign from its board of director.

This article describes the story of the Bardu farm. It draws on my full-time resident involvement with Teal's project as INAR's Associate Director of Research between 1968 and 1972, on my part-time long-distance involvement as a volunteer advisor to the Teal family and as a founder and director of the Musk Ox Development Corporation between 1982 and 2021 and on documentary sources, including Teal's papers at the Rauner Special Collections Library at Dartmouth College.

The idea of the Bardu farm takes shape

The Bardu farm was originally called the Troms Project (Teal letter of 28 June 1968 to Engelstad; this and other letters

cited herein are housed at the Rauner Special Collections Library), after the county where Teal wanted to locate it. Teal was its inspiration and the initial driving force behind it. The other key person was Alfred Meyer Henningsen. Henningsen (1918–2012), a resident of Bardu, was a highly decorated WWII hero. He was the mayor of Bardu County from 1956 to 1962, deputy mayor in 1968 and mayor again from 1976 to 1979. He was a Lieutenant Colonel and the Commander of the Troms Home Guard from 1956 to 1975. He served as the member of the Norwegian parliament, or Storting, for Troms County from 1961 to 1973 (Blix e-mail of 18 February 2021 to Wilkinson; Blix 2023). Henningsen was largely responsible for the selection of Bardu as the site of the farm. He was the president of Norsk Moskus A/S, the owner of the farm and the musk oxen. His commitment to tourism influenced Teal's decision to withdraw.

It is not surprising that Teal wanted a musk ox farm in northern Norway, since his travels there with his wife, Penelope (née Holden), in the early 1950s influenced his decision to domesticate the musk ox. He studied Norwegian and Swedish at the Berlitz School in New York in the winters of 1948 and 1949. He was aware of the widespread poverty in Norway's northern provinces, which he described as "long-neglected" (Teal 1953). He was also aware (Teal 1954) of the imports of musk ox calves from Greenland to Norway by Norway's Svalbard and Arctic Ocean Survey to diversify Norway's indigenous fauna (Lønø 1960; Blix 2023). He particularly cited Norwegian knowledge of such matters as feeding habits and sicknesses acquired from those animals. He cited the assertion by the farmer in charge of some of them before their release, Johan Angard, that he would rather have musk oxen as domestic animals than any other species in support of his decision to domesticate musk oxen, and he described how Mrs Angard collected their qiviut, spun it into yarn and knitted it into gloves to illustrate the textile potential of the qiviut.

Teal mentioned starting a farm in Norway in letters dated 25 October and 10 November 1966 to Dr Glenwood L. Creech at the University of Kentucky. Creech was involved in establishing the Fairbanks farm when he worked at the W.K. Kellogg Foundation. The second letter mentioned that Henningsen visited the Fairbanks farm in March 1966. Teal told Arne Krafft of the Norwegian Directorate of Wildlife and Freshwater Fish in a letter dated 3 March 1967 that he had been in contact with Henningsen since early 1966 about establishing a breeding herd of musk oxen on an island in north Norway.

Jørgensen (2015) reported that Teal visited Tromsø and Bardu in 1966. According to her, he planned to import musk oxen from Fairbanks to Norway. The Fairbanks herd numbered only 35 at the time (Wilkinson 1972). Teal would have had to reduce its size by at least

50% to provide a useful number of animals for a Norwegian farm, which would have compromised his plans for Alaska and probably been unacceptable to the W.K. Kellogg Foundation and the University of Alaska, which were supporting the Fairbanks farm.

Henningsen wrote to Teal on 11 October 1966 that the Norwegian Minister of Agriculture and his deputy were interested in the proposed farm. He invited Teal to meet them, but there is no record of such a meeting. According to Jørgensen (2013a), Henningsen wanted the Norwegian government to finance the farm. The Norwegian government mandated veterinarian Dr Magne Sandbu to visit the Fairbanks farm in 1968 to prepare a report on the suitability of domesticating musk oxen in Norway (Jørgensen 2015). Sandbu recommended against establishing a musk ox farm in Norway because of his evaluation of the danger posed by parasites. In his letter of 26 June 1968 to Henningsen, Teal professed astonishment at Sandbu's recommendation. He insisted that, since the advent of the medication Thiabendazole in about 1960, stomach parasites had been eradicated from his farm-raised musk oxen. He also stated that there had been no parasites at Fairbanks and Old Fort Chimo. He attributed Sandbu's position to his poor command of English. Contrary to Teal's claims, however, parasites were a problem at Tunturi, Fairbanks and Old Fort Chimo (Wilkinson 1972). Teal knew that, but his letter, nevertheless, offered to provide supporting affidavits from veterinarians. Fortunately for him, the Minister did not request such affidavits.

Teal wrote to his friend Peter Corrin Strong, the wealthy son of a former US ambassador to Norway and later the president of the American–Scandinavian Foundation, on 11 November 1966 that Odd Smith-Robertsen, a journalist in Tromsø and an enthusiast for the idea of a musk ox farm in Norway, would arrange for him to give a series of lectures in the area during the forthcoming winter. According to Teal, the residents of the mountain villages in Norway did not like the musk oxen that had been transplanted there. They wanted Teal to relocate them to offshore islands or to an unidentified area on the north Norwegian mainland that had been offered to INAR. Teal (1970) reported that Henningsen visited Fairbanks again in 1967, and Teal met him in Oslo in June of that year (Teal letter of 24 May 1967 to Henningsen).

The earliest reference to a possible farm site in Norway was in a letter of 16 August 1966 from Halfden Grande to Teal offering him the use of a 66-hectare site on the island of Torsk, located near the village of Torsken (69°20'N, 17°06'E), some 200 km south of Tromsø. Teal did not accept Grande's offer. He wanted a site near Tromsø (letter of 9 November 1967 to Strong). He preferred an ice-free island, where a costly perimeter fence would not be

required. He inspected five islands near Tromsø by helicopter on 1 March 1968 (undated letter to Egil Damsgård of Tromsø). According to his letter of 26 June 1968 to Henningsen, he considered two of them suitable, but he found the others too remote.

Edgar Holen, representing a committee created by the municipality of Bardu, wrote to Teal on 30 July 1968, informing him that Henningsen had asked the municipality to host the farm. Teal wrote to Holen on 8 September 1968, explaining that the advantages of Tromsø were its proximity to veterinarians, to the Tromsø Museum and to the planned university. According to his letter of 8 September 1968 to Henningsen, however, he was not opposed to having musk oxen at Bardu, but he considered that it would be better to send musk oxen there from a founding farm near Tromsø than make it the founding farm.

Teal told Henningsen in a letter of 30 June 1967 that he envisaged the planned farm as a collaboration between INAR, the government of Norway, the Tromsø Museum and several citizens of Tromsø to whom Henningsen had introduced him. Nevertheless, his reply of 8 September 1968 to Holen confirmed his willingness to explore the idea of locating the farm at Bardu. It is puzzling that Henningsen told Teal in a letter of 31 July 1968 that the two of them had been outmanoeuvred in their attempt to locate the farm near Tromsø if, as Holen said, Henningsen asked Bardu to host it.

The Bardu municipal council voted in early 1969 to host the farm. Teal reported to Dr Russell Mawby of the W.K. Kellogg Foundation on 21 April 1969 that Bardu had fulfilled its requirements to have the farm. He noted, however, that the support of the Norwegian Ministry of Agriculture was still needed, but that the Minister appeared to be dragging his feet. He knew that Mawby was scheduled to meet the Minister. He asked him to intervene with him, but Mawby could not. Teal visited Bardu in May 1969 to select a site. On 25 May 1969, on behalf of INAR, he signed a 10-year agreement with the municipality of Bardu. INAR made the following commitments: to capture the initial breeding stock; to provide a detailed domestication programme; to provide an experienced station manager; to establish training exchanges between Bardu and INAR's other musk ox farms; to assist in designing programmes of marketing and price support for musk ox products; and assist in solving any special matters. The agreement did not mention responsibility for capital or operating costs, tourism or training knitters of qiviut products. It did not define domestication, but Teal had never changed the definition in his notebook, cited earlier, that domestication meant taming, raising in captivity and selective breeding, which would ultimately produce animals visibly different from their wild predecessors.

The failure of the agreement to describe in detail the purposes of the farm is striking. Based on conversations with Teal at the time, his objective was to use the qiviut from the farmed musk oxen as the raw material for hand-knitted garments that would provide local women with a way of earning cash that was compatible with their other domestic responsibilities, which was also his objective in Alaska and Québec. Engelstad (1971), the first manager of the Bardu farm, referred to the planned use of qiviut “by a local industry in the knitting of luxury garments for sale.” Teal’s above-cited letter of 8 September 1968 to Henningsen showed that he also anticipated providing musk oxen to other farmers, which was his original intention for Alaska and northern Québec (Wilkinson 1971). Jørgensen (2013b) said that the Bardu farm would provide other farms in the area with two or three musk oxen each. Tourism was not a stated purpose of the farm, but, in the absence of any other start-up funding, it would have to be an important source of operating income. Blix (2023) said that selling high-quality qiviut products and tourism were the farm’s purposes. There is no evidence that the Bardu authorities, Henningsen or Teal undertook any public consultation or information sessions to assess the local reaction to the project.

By mid-August 1969, the municipality, assisted by a public stock company, Norsk Moskus A/S, that it owned in part and of which Henningsen was the chairperson and chief executive officer, was the farm’s sponsor. Peter Strong was the principal shareholder (1070/1860 shares; Blix 2023). The Bardu Municipality was also an important shareholder (250/1860 shares). The remaining 125 shareholders were predominantly local persons holding a few shares each, which presumably indicates some level of local acceptance of the project. Teal did not own any shares.

Despite his initial preference for an island and a site near Tromsø, Teal was satisfied with Bardu. He wrote to Diederik Bellaar-Spruyt, the manager of the Old Fort Chimo farm, on 28 May 1969 that “The Bardu site. . . is fine.” Elsewhere (Teal 1970), he described it as “A splendid farm, backing up on the mountain tundra. . .”

Capturing the founding stock

Teal abandoned a plan to capture the founding stock in early 1968 from imported musk oxen released in Dovrefjell, a mountain range in central Norway, in favour of a capture in east Greenland (Teal letters of 10 November 1966 to Russell Mawby, 11 November 1966 to Peter Strong and 23 June 1967 to Steven C. Rockefeller). He had to cancel that capture because he had not raised the necessary money (Teal letter of 28 June 1968 to Engelstad). The Norwegian government then proposed that it be carried out in 1969, but Teal said that it might have to wait until 1971 or 1972,

although he did not explain why. Nevertheless, he carried out the capture in 1969 (Teal 1970), since the Norwegian Foreign Ministry advised him in mid-July that the Danish government would not extend its 1968 permit to capture 10 male and 15 female calves to 1970 (Teal letter of 29 July 1969 to Isaac Kleinerman). The Danish newspaper *B.T.* reported on 14 March 1968 that the permit was issued free-of-charge. It restricted the capture to the area north and west of Franz Josef Fjord (73°27’N, 25°00’W) and south of Gael Hamke Bugt (74°00’N, 20°30’W). The Veterinary Directorate of the Norwegian Department of Agriculture issued a permit to the Bardu Municipality on 7 August 1969 to import the 25 calves.

Except where otherwise noted, the following description of the capture is based on Teal’s account in *The American–Scandinavian Review* (Teal 1970) and his report of 26 August 1969 to A.C. Norman, the Minister for Greenland of the Danish government.

Teal undertook a tour of Norway in May 1969 to arrange the capture. The first plan was for the capturers to fly into the 1800-m gravel airstrip at Mestersvig (72°14’N, 23°55’W), a former lead–zinc mine and military base on Greenland’s east coast, and to fly the captured calves from there to Tromsø. Teal sent two men with a 9.7 m boat with a motor and spare parts to Mestersvig on the 1969 annual supply ship. The boat was to be used to travel the adjacent fjords in search of calves and to bring them back to Mestersvig. He abandoned that plan because he concluded that the distances and required times were unrealistically great. He chartered a Hughes 300 helicopter from Saab Helicopters of Norrköping, Sweden. He also chartered the 43.9 m sealer *Harmoni* from Jakobsen Brothers of Tromsø. Using the *Harmoni* to search for calves would reduce the flying hours of the helicopter compared with being based at Mestersvig, while keeping the calves in its hold would obviate the need to find a building at Mestersvig and would virtually eliminate the danger that a calf might escape. Olaf Jakobsen told Teal in a letter of 4 July 1969 that a helicopter platform could be built on the *Harmoni*. In fact, the helicopter was dismantled for the journeys to and from Greenland. On arrival in Greenland, a platform was built on two open boats. They transported the reassembled helicopter from the *Harmoni* to the mainland on arrival and brought back the disassembled machine on departure. Teal worried that the expedition might become trapped in the ice on its attempted return to Norway. He shipped hay and other supplies to Mestersvig in case the *Harmoni* had to overwinter there with the calves.

Henningsen advised Teal by a letter on 12 May 1969 that the Norwegian Department of Defence would try to fly the calves to Tromsø, which would have eliminated the danger of being trapped in the ice. In a cable of 29

August 1969, after the calves had been captured, Teal told Norwegian Defence Minister Otto Grieg Tidemand that the calves were safely on the *Harmoni*, and that the aircraft could be cancelled.

Teal realized that the capture was taking place too early in the year to allow calves to be sexed from the air using the technique of observing a red-stained rump on females that he developed during an earlier capture, since the stain appeared only in late summer or early fall. He estimated consequently that 50 captures might be needed to achieve the authorized sex ratio, and he calculated that there would have to be around 600 musk oxen in the permit area to make that possible. According to an article in the *Tundra Times* of Fairbanks on 5 October 1969, 41 captures were needed.

Teal led the 15-man capture team, which included a veterinarian appointed by the Norwegian Ministry of Agriculture, two representatives of the weekly Norwegian newspaper *Aktuell* and an observer from the Government of Denmark. Dr Christian Vibe, an eminent Danish zoologist with extensive experience with musk oxen in Greenland, suggested trying to complete the capture by 1 September to avoid disturbing the musk oxen during their breeding season.

The *Harmoni* sailed from Tromsø on 12 August 1969. It reached Greenland three days later. The first capture took place on 18 August and the last on 25 August, safely before the deadline suggested by Vibe. The population density of musk oxen was high, so most of the captures were made within 12 km of the fjords. The total number of flying hours was only 40. Two days were lost to fog. The capturing technique was the one that Teal developed on Ellesmere Island in 1967, when he captured 15 calves for the Old Fort Chimo farm. It used a helicopter to separate a cow and a calf from the herd. The capturers separated the cow and calf by throwing rocks or sods at them and by shouting and gesticulating, allowing the calf to be roped or caught by hand. The helicopter flew the captured calves to the mainland near the *Harmoni*, from where they were transported to a ship by an open boat. One calf died soon after capture. The Danish representative authorized the capture of a replacement. The *Harmoni* arrived back at Tromsø on 30 August. The calves were trucked to Bardu.

Little is known about the cost of the capture or who paid for it. In a letter of 5 December 1969 to Teal, Henningsen estimated that it cost NOK 250 000–300 000 NOK (roughly 27 000 USD). That estimate is reasonable or even conservative: chartering the *Harmoni* cost 157 000 NOK; the helicopter charter cost at least 55 692 NOK; and sending the open boat to Mestersvig cost at least 150 000 NOK. Norsk Moskus A/S approved a capture budget of 150 000 NOK based largely on Strong's purchase of its

shares (Blix 2023). Teal told Henningsen in July 1969 that INAR would try to respect it and would pay any additional cost, but he clarified in a letter of 18 December 1969 that INAR would not have the money until spring 1970. Norsk Moskus A/S actually contributed 186 000 NOK. The Norwegian Department of Defence donated 150 000 NOK. There were many outstanding debts at the end of the capture. According to a letter of 31 March 1970 from Henningsen to Teal, Saab Aktiebolag of Sweden, the parent of the Norwegian helicopter charter company, paid 53 947 SEK to the Bardu Municipality to settle the outstanding expedition debts.

Starting the farm

Norsk Moskus A/S initially leased the abandoned 70-hectare Øistad farm 12.9 km from Setermoen in the Bardu Municipality. It bought the farm in the autumn of 1970 (Blix 2023). Teal wanted the farm's layout to be similar to that of the Fairbanks farm, where Engelstad trained. Nothing was ready when the calves arrived: the buildings were derelict; only a small amount of inadequate sheep netting was in place in lieu of proper fencing; and water had to be carried in barrels on a sled from a nearby river (Blix 2023). The musk oxen were kept in small enclosures surrounded by netting for the first two years (Blix 2023). The Norwegian Armed Forces initially provided a water truck and then, in April 1970, replaced it with a decommissioned Jeep (Blix 2023). Norsk Moskus A/S, assisted by the municipality, used borrowed money to erect adequate fencing and for other improvements (American–Scandinavian Foundation 1970; Blix e-mail of 18 February 2021 to Wilkinson).

Despite the 1969 agreement between INAR and the Bardu Municipality and the dominant role of Norsk Moskus A/S, the farm's relationship with local farmers was not always harmonious, even in its early days. Engelstad's weekly report of 4 September 1970 said that the fencing programme was suspended because of conflicts with local landowners, who were, according to him, asking ridiculous prices for previously unused land. He said that the animals would have been moved from the Øistad farm to the farm of Peter Karlstad, a local farmer who was working on the farm, in response to the conflicts, were it not for the combined house and barn that were being built on the Øistad farm. Blix (2023) reported that there was much initial local support for the farm, but that critical voices emerged when the musk oxen were put out to graze. He described "sabotage" of the fencing in 1973, which allowed several musk oxen to escape for two months. The police investigation was dropped for lack of evidence.

Condition of the herd

Information about the growth of the herd and the health of the animals is sparse. Herd growth was slow. Alendal (1984) referred to high mortality rates and low recruitment due to disease, parasites and accidents. Even though Teal had dismissed Sandbu's warning about the danger from parasites, he consistently directed Engelstad to examine faecal samples for parasites and to administer Thiabendazole or other medication when needed. He even told him in a letter of 2 October 1969 not to allow local farmers to visit the farm and to clean all hay feeders and watering troughs to reduce the danger of parasites. Engelstad implemented Teal's recommendations thoroughly. For example, his letter of 25 October 1969 to Teal listed the following measures in effect: mineral salt blocks were always present in the fields; iron was administered; vitamin A, D and E injections were given; faecal samples were collected, though Engelstad did not have a microscope with which to analyse them until November 1970, and even then he did not at first have an identification manual; the hay feeders were moved weekly; the hay was bought from farms where sheep had never been present and stored at facilities where there were no sheep.

Nevertheless, diarrhoea was a problem by early October 1969, just four weeks after the calves arrived. Some parasites, in particular the *Moniezia* tapeworm, according to the Oslo Veterinary Research Institute, may already have infested the calves when they were caught (Engelstad letter of 25 October 1969 to Teal). Others may have been present in the hold of the *Harmoni* where the calves were held, which had been used to store seal meat. And others may have been present in the pastures at Bardu, where sheep had grazed (Wilkinson 1972). The small size of the enclosures in which the animals were kept for the first two years perhaps aggravated the situation. One female died of a massive tapeworm infestation, possibly compounded by a secondary infection of the liver, on 12 October 1969 (Wilkinson 1972). A second female died at about the same time, when an inexperienced veterinarian attempted to give her an injection. The news was not, however, uniformly bad: in his weekly report of 10 October 1969, Engelstad said that only two animals had a recurrence of diarrhoea after they were treated; Engelstad's weekly report of 6 March 1970 recorded that Teal was satisfied with the condition of the animals when he and Dr James Beckley, the veterinarian serving the Fairbanks farm, visited for dehorning in March, although he found that all the animals were small. The calves were indeed small. When Engelstad started to weigh them, in November 1969, they were roughly half the weight of Fairbanks animals of the same age. Engelstad believed that the diarrhoea contributed to

their low weights. Engelstad's weekly report of 11 September 1970 noted that three animals suffering from diarrhoea were the first such cases since October 1969. In a letter of 18 March 1971, Teal expressed satisfaction that the animals were doing well.

A calf infested by tapeworms had to be euthanized on 17 October 1970. She developed colic and constipation in July 1970, and blood tests revealed severe anaemia. Nursing care and medication did not improve her condition (Wilkinson 1972). In a letter dated 23 March 1971 to Engelstad, parasitologist W.M. Samuel of the University of Alberta observed that "Generally, the Bardu animals appear to have more species and heavier burdens of parasites than other groups of animals" (i.e., free-living animals on Bathurst Island, Devon Island, Nunivak Island and Spitsbergen, and captive animals at Old Fort Chimo). He said that four species of *Eimeria* tapeworm were identified in fairly high numbers in the Bardu animals, which he considered to indicate a potential problem. All the animals were infested with *Eimeria* and a nematode.

Teal told Henningsen in a letter of 18 December 1969 that he and Beckley would dehorn the calves in late January 1970. Their visit was postponed because two calves were at an agricultural exhibition in Oslo. Beckley surgically dehorned the 24 surviving calves on 3 March 1970 in the presence of five Norwegian veterinarians. The surgery lasted from 13:45 until 18:30. All the calves were well after the surgery.

Five calves were born in 1973. One of them was rejected by its dam and subsequently died, as did two others. The surviving male was killed by an incompetent veterinarian at the age of six years. The surviving female lived to the age of 22 years and produced 10 calves. Two calves were born in 1974 (Blix email of 18 February 2021 to Wilkinson). One was stillborn. The other was born to a cow that had escaped from the farm. She and the calf were observed by tourists in the mountains in the fall of 1974. They were never seen again. As of December 1974, eight males and 11 females were alive (Jørgensen et al. 1984; Mathiesen et al. 1985). Because of financial difficulties, two adult males and two adult females were sold to the Lycksele Djurpark, a zoo in Sweden, in May 1975.

A severe attack of contagious ecthyma, caused by the papilloma virus, hit the herd in January 1975. Nine calves and four six-year-old males died. Contagious ecthyma continued to cause many mortalities after the farm was closed (Blix et al. 2011).

In spring 1976, when the herd was moved out of Bardu, it consisted of 11 females and three males, 11 less than the number in the founding herd seven years earlier. One of the original females lived to the age of 28 years, a world record at the time.

Staff

The small size of the herd never required a large staff. Nils Engelstad, a Norwegian, was the first manager. He studied for two years at George Washington University in Washington, D.C., before joining the Glaciology Section of Inland Waters Canada. He worked in the Rocky Mountains and the Arctic. He met Teal in Eureka, N.W.T., in 1967, when Teal was capturing the musk oxen for the Old Fort Chimo farm. Teal hired him on 7 September 1969 for a two-month trial at Bardu, but he told Henningsen that his salary should start on that date to cover his participation in the capture. Engelstad's contract described his duties as follows: the constant care of the calves; a weekly report to INAR (but not to the Bardu Municipality or Norsk Moskus A/S!); constructing appropriate facilities for the animals; establishing harmonious relationships with the public and others. It did not mention a role in tourism or producing or marketing qiviut items. Engelstad's contract was with INAR, but it said that he would be considered an employee of the Bardu Municipality or Norsk Moskus A/S when he was at Bardu, and that they would pay his salary. Neither the municipality nor Norsk Moskus A/S was a party to the contract. I found no evidence that either of them knew about or agreed to the obligations in question.

Teal was generally satisfied with Engelstad's work. He told Henningsen in a letter of 15 January 1970 that Engelstad never failed to submit a weekly report. He commended Engelstad in a letter of 4 May 1971 that "You have obviously been doing a fine job with the animals." Engelstad's relationship with the board of directors of Norsk Moskus A/S was not, however, uniformly good. According to his weekly report of 23 April 1971, Engelstad believed that the board blamed him unfairly at its meeting of 7 April 1971 for the farm's poor relationship with some local persons. He asked it to disavow its position, failing which he would resign. It did not do so. He resigned effective from 10 June 1971. Henningsen told Teal in a letter of 27 April 1971 that Engelstad was threatening to resign. Teal wrote to Engelstad on 16 May 1971 to express his regret. Henningsen's letter to Teal recognized that Engelstad did a good job with the animals, but he referred cryptically to unspecified behaviours that were "not for the benefit of the animals" or "remote areas of the north."

Larseraq Skifte, an Inuk from Greenland who trained and worked as a herder at Fairbanks in 1969 and 1970 and who took part in the 1969 capture, assisted at the farm for a few weeks after the capture (Engelstad Weekly Reports 7 and 13 September 1969, Rauner Special Collections Library). Peter Karlstad replaced Engelstad after his resignation. He started to help with feeding milk

to the calves and other tasks when the farm opened and was appointed Assistant Manager in September 1970. Other local persons who worked at the farm were Carl Petter Brun, in September 1969 and June 1970, and Kate Korreberg, in July 1973.

Short-term volunteers were also important. They included Hugh Lawrence (May–August 1970), a former volunteer at Fairbanks; future Unalakleet farm manager and executive director of Musk Ox Development Corporation Bart Watson; Danish zoologist Hans Pedersen (August 1970); Pat Font, an English hitchhiker (November–December 1970; Engelstad Weekly Report 4 December 1970); Swede William Lundin (July–August 1971). Karlstad resigned in 1973. Lundin and Lennart Norberg managed the farm until 1975. Per Martin Hansen and Arne Dinesen managed it from then until it closed.

Recognition as a domesticated animal

Even before the farm site was finalized, Teal tried to have farm-raised musk oxen recognized as domesticated under Norwegian law. He tried unsuccessfully to achieve the same goal in Alaska. His motivation was a fear that herders would have little recourse if hunters killed their domesticated musk oxen. That fear was understandable for Alaska when his goal was to establish small herds in unenclosed pastures in isolated villages where subsistence hunting was central to the economy, but such herds were not the plan for Norway, and the economy of the Troms region was not based on subsistence hunting. By letter of 7 September 1968, he asked Henningsen to table in the Storting a bill defining farm-raised musk oxen as domesticated animals. He told Donald O'Brien, his legal counsel in Burlington, Vermont, in a letter of 21 September 1968 that Henningsen agreed. Henningsen did not, however, make any serious effort. The Storting never recognized farm-raised musk oxen as domesticated.

Social and economic benefits

From its conception, the musk ox farm was meant to bring social and economic benefits to the surrounding communities by offering income-generating opportunities. As it turned out, there was no attempt to establish subsidiary farms, which had been one of Teal's original ambitions. There was some progress in establishing a qiviut industry, another of Teal's objectives. Making the musk ox farm into a tourist attraction, which was not among Teal's original priorities for the farm, seemed for a while to hold the most promise.

Tourism

Tourism could not begin until the calves were released from quarantine, in January 1970. It took off quickly. The farm attracted 13 000 paying visitors in 1970, 12 000 in 1971 and 30 000 in 1972. The entry fee was 5 NOK. Teal initially supported the idea of using tourism to make the farm financially self-supporting. In a letter of 12 September 1970 to Henningsen, he referred to an influx of 800 tourists in one day as “most encouraging” and expressed the conviction that, once the farm was complete, tourism would go a long way towards covering its operating costs. Norsk Moskus A/S’s plan for tourism included a building at the farm with a restaurant and visitor accommodation above a barn. According to Henningsen’s letter of 2 July 1971 to Teal, the first guests were to be Strong and a party of three, 12–17 July 1971. Teal did not oppose that plan. He asked Engelstad in a letter of 27 August 1970 “How’s my room coming along in the palace?” In a letter of 13 April 1971 he told him that “I would like to try out the new house and Norwegian air and finish my book.”

An early sign that the importance of tourism for Norsk Moskus A/S was beginning to outweigh the importance of the health of the animals was Engelstad’s observation in his weekly report on 9 October 1970 that “The Board is building a house so expensive that they are very reluctant at giving me the money to buy materials for the stalls inside the barn. I sure hope that the musk oxen aren’t becoming second to the tourism.” Teal did not immediately pick up on Engelstad’s concern. It was only when he spent two weeks in Bardu in summer 1971 that he concluded that tourism was dominating the farm to the detriment of the animals’ well-being. He told Strong in a letter of 30 August 1971 that he found a sick and dying herd neglected by the keepers. He described the situation as a “perversion of purpose from economic agriculture to tourism.” He claimed that Henningsen launched an attack in the press in which he asserted that the farm’s only value lay in tourism. He did not document his assertion of a sick and dying herd. Engelstad had resigned only two months earlier. Teal had always been satisfied with the quality of his care for the animals. He had complimented him on the condition of the animals as recently as in a letter of 18 March 1971. Teal told James Buckley, a US Senator and a participant in Teal’s 1967 capture on Ellesmere Island, and Strong in a letter of 15 August 1971 that he attended a meeting of the board of Norsk Moskus A/S on 10 August 1971. He described the members of the board as rubber stamps for Henningsen’s view that tourism must be the farm’s primary activity. He asked Buckley and Strong, both shareholders in Norsk Moskus A/S, to give him their proxies so that he could make changes within the organization. Neither of them did so. He wrote

to them again on 17 August 1971 describing his decision to suspend INAR’s involvement in the farm. He reiterated his view that tourism was an acceptable activity at the farm, but he added that INAR “was not in the business of setting up tourist traps” and expressed the view that “it could well be that shortly tourists would see nothing but a pile of dead meat.” He told Buckley and Strong that he reported his differences with Henningsen to Karlstad and the head of the local Rotary Club, who told him that there was a strong local perception of mismanagement, and that they supported the idea of replacing Henningsen. According to Teal, the president of the Bardu bank Sparebank wanted INAR to resume its involvement in the farm. Teal again asked Strong and Buckley to assign their proxies to him or another sympathetic person. Again, they did not do so.

Although the precise circumstances in which Teal’s involvement at Bardu ended are unclear, a disagreement about tourism seems to have played a decisive role. Teal wrote on 30 March 1977 to Norwegian explorer and archaeologist Helge Ingstad and his archaeologist wife, Anne Stine, that INAR withdrew from the Bardu farm in 1971 because “the people in charge up there seemed to be more interested in tourism than in the proper care of the animals and the development of the economic purposes of the whole project based on textiles.” Blix, on the other hand, told me in an e-mail of 18 February 2021 that Henningsen literally chased Teal off the farm on 16 August 1971 because of their disagreement about how the farm, primarily the tourism operation, was being run.

The extent to which the tourism generated by the farm economically benefitted people in the Bardu area or extended the lifetime of the farm is unclear. The small scale and short duration of the tourism operation suggest that it was not great. The only financial report for the farm on file at the Rauner Special Collections Library is for 1970. It shows that tourism generated 55 000 NOK towards an operating cost of almost 168 000 NOK.

Qiviut products

The fact that the firm Husfliden Bergen, which had much experience in processing ‘wild’ qiviut, was commissioned to spin the farm’s raw qiviut by September 1970 illustrates the importance initially attached to producing high-quality qiviut products. Norsk Moskus A/S displayed a qiviut dress at the National Agricultural Fair in Oslo in February 1970. Two calves from Bardu that were delivered on a C-130 Hercules of the Royal Norwegian Air Force were also displayed (Blix e-mail of 18 February 2021 to Wilkinson). The dress was said to be “as light as a snowflake and warm” (cited by Jørgensen 2013a). An

article in the newspaper *Aftenposten* on 12 December 1970 stated that Norsk Moskus A/S planned to produce sweaters designed by Mrs Bergljot Henningsen, Henningsen's wife (reference in Jørgensen 2013a). Because of the high cost of qiviut and the time required to handspin the yarn, the sweaters were to be of sheep's wool, but qiviut figures of musk oxen would circle the yoke in single file. Lillian Schell, INAR's textile expert at Fairbanks, referred (Schell 1972) to a design contest with a prize of 20 000 NOK, which Helen Griffiths (later Howard), another senior member of INAR's team at Fairbanks, thought (Griffiths 1971) was held in 1971. An article in the local newspaper *Lofotposten* in October 1971 said that Norsk Moskus A/S was looking for local persons to knit the sweaters. The first sweater was given to Teal for his 50th birthday, on 7 February 1971. The first handmade qiviut products, three shawls, were sent for sale in Bergen in March 1971 (Jørgensen 2013a). Regular production of sweaters never started. After the farm was closed, in 1976, there was only a small supply of raw qiviut, and the production of qiviut garments ended. After the take-over of the herd by the University of Tromsø, a small quantity of raw qiviut was sold to knitters across Norway. The university also sold 50–60 kg of raw qiviut to Oomingmak for roughly 100 USD per US pound (ca. 0.45 kg) in 1996.

Blix (2023) has cast doubt on Teal's belief that qiviut could form the basis of a domestic handknitting industry view by suggesting that Teal neglected to tell the Bardu authorities that each animal produced only about 3 kg of qiviut per year. That would have been relevant if the plan had been to sell raw qiviut. Blix recognized, however, that the plan was "that local housewives would use [the qiviut] for knitting exclusive woollen products" (Blix 2023: 15; my translation), as was the case in Alaska. At the time, the basic unit of production was the scarf. Each scarf weighed about half an ounce (ca. 14 g) and sold for about 50 USD. Therefore, each adult animal's annual production of some 3 kg of qiviut would have generated roughly 200 scarves and about 10 000 USD. In spite of the high production costs, the financial picture would have been rosier than Blix suggested.

Economic viability

Little is known about the farm's finances. There was no feasibility study before it was started to examine whether it could be economically viable. The implicit expectation was that tourism and the sale of qiviut products would eventually cover or exceed the running costs. Teal knew from his experience elsewhere, however, that several years would pass before the herd produced a commercially useful quantity of qiviut, and likely several more years before

sales of qiviut products generated a significant income. In the short term, start-up capital and operations funds would be needed to build the farm, to support the animals and to implement tourism and the qiviut industry. He had negotiated financial and in-kind start-up support for the Fairbanks/College, Old Fort Chimo and Unalakleet farms, all of which lost much money, even though Oomingmak sold large numbers of qiviut garments. The fact that Teal went ahead with the Bardu farm without any assurances of financial or in-kind support was in my opinion irresponsible. It is also puzzling that Henningsen, an experienced regional mayor and national politician, went along with the plan; he seems to have assumed mistakenly that his status as a member of parliament would help him to raise state support (Blix 2023).

Within two months of the calves' arrival, Norsk Moskus A/S wrote to Teal that it could not pay for the outstanding capture expenses, and that it needed 100 000 NOK for construction expenses, salaries and feed. It asked him for financial support from INAR, but none was available. Henningsen wrote to Teal on 10 October 1970 that Norsk Moskus A/S had no money to pay the company that was building the combined barn and restaurant on the farm or for Engelstad's salary, but he said that the Agricultural Research Council would give 30 000 NOK towards the cost of the building. The only year for which I found a financial report is 1970. The farm's operating cost that year was 167 858 NOK. The only recorded income was from tourism and totalled 55 000 NOK. The District Development Fund authorized a loan of 300 000 NOK to Norsk Moskus A/S in spring 1971. It was guaranteed by Norwegian shipping magnate Hilmar Reksten, a friend of Henningsen, who advanced 215 000 NOK that could be repaid at any time. Combining this loan with the grant from Saab Aktiebolag mentioned earlier, Norsk Moskus A/S was thus able to pay off its accumulated debts. Teal tried unsuccessfully to raise money in the Seattle area in 1971 to help the farm.

Closure

A bull, one of three musk oxen that had escaped from the farm (Jørgensen 2013b; Blix 2023), killed a local hunter in October 1975. Given the timing, it is reasonable to assume that the bull was in rut. A police investigation did not ascertain exactly what had happened, but the killer bull had been shot in the eye with a shotgun in 1974 by a grouse hunter who claimed that it had almost killed him (Blix 2023). A military patrol killed the bull. The two other escapees were found at the end of October and were led back to the farm. The mayor of Bardu immediately demanded that the farm be closed (Blix 2023). The Bardu municipal council approved the closing in spring 1976. A

part of the farm was sold in 1977, and the remainder in 1978 (Blix 2023). Norsk Moskus A/S was dissolved in 1980. The farm was closed, and the herd was moved to the University of Tromsø for research purposes.

Analysis and conclusions

The Bardu farm did not achieve any of its animal husbandry or socio-economic goals. Allowing for reasonable mortality rates, the herd should have numbered at least 50 head by 1976, but it contained only 14 animals. No attempt was made to establish subsidiary herds. The tourism initiative attracted respectable numbers of visitors, but it was uneconomic. The qiviut industry was tiny and short-lived compared to its Alaska counterpart.

There is insufficient information on the husbandry operation to permit reliable conclusions about the reasons for its failure, although the losses of several animals to contagious ecthyma at the turn of 1974–75 and of 13 animals in summer 1975 (Blix 2023) were undoubtedly important contributors. Contagious ecthyma occurred among the Fairbanks musk oxen in September 1976 and among the Unalakleet animals (which came from Fairbanks) in 1977. Two calves died of starvation at Fairbanks, and three yearlings at Unalakleet, because the contagious ecthyma-caused cankers in their mouths prevented them from eating. No adults died at either farm. The reason why the disease was more lethal at Bardu than on the Alaska farms is unknown.

Blix asserted to me in our correspondence that Teal contributed to the farm's failure because INAR made no financial contribution to it. The lack of money contributed in many ways to the farm's failure, but I consider it unfair to blame Teal or INAR. There is no evidence that Norsk Moskus A/S, of which Henningsen was the chief executive officer, ever asked Teal for such a commitment. Henningsen visited the Fairbanks farm before the Bardu farm was established and had opportunities to learn about its financial challenges. He should have known that operating the Bardu farm would be expensive and, probably, unprofitable, especially in the early years. He appears to have been confident that his status as a member of parliament would allow him to raise the required funding (Blix 2023). Given the obvious lack of funding, the September 1969 decision of Norsk Moskus A/S to construct a building at the farm that had cost 336 000 NOK, excluding the cost of furnishings (Blix 2023), was irresponsible.

Blix also considered that Teal's dismissal of Sandbu's 1968 prediction about the danger from parasites contributed to the farm's failure. Teal's dismissal of Sandbu's concern was irresponsible, but the record is clear that he

consistently instructed Engelstad how to deal with parasites, and that Engelstad followed his instructions. Parasites were a problem at Bardu to about the same extent as at the other farms, but they were not a principal cause of its failure.

Blix felt that Teal's reassurances to Norsk Moskus A/S regarding the tameness, intelligence and tractability of farm-raised muskoxen ultimately led to the killing of a hunter that provoked the farm's closure. He also felt (Blix 2023) that my writings (Wilkinson 1971) under-communicated the problems with turning musk oxen into domesticated animals. Teal's view was based on over 20 years of experience at the Tunturi, College and Old Fort Chimo farms, where intensive and continuous efforts were made to ensure the long-term tractability of the musk oxen and where there had been no serious human injuries and no deaths. Teal appreciated that rutting bulls, in particular, were dangerous, and he ensured that the College farm took numerous measures to reduce the threat from them, including sustained taming, castration, dehorning and horn trimming. Constant efforts were made to ensure that muskoxen could not escape. The views that I expressed were based on what I had learned from Teal and Diederik Bellaar-Spruyt and on my three years of working part-time as a herder at Old Fort Chimo and Fairbanks. I know from personal observation that Engelstad was instructed at College about the danger from rutting bulls and how to deal with them. The absence of injuries to humans during his tenure as manager at Bardu may suggest that he applied what he was taught. Surgically dehorning musk oxen was one measure that Teal implemented to reduce the danger that they might seriously injure one another or humans. I am not aware that any of the Bardu musk oxen were dehorned or had their horns trimmed after Beckley's 1970 surgery, which Teal arranged and to which he invited several Norwegian veterinarians. The several references to escapes, sometimes for several months, by Bardu musk oxen suggest that the fencing may have been as inadequate in later years as when the farm was founded. Norsk Moskus A/S must assume full responsibility for the failure to continue dehorning, for not promptly killing or capturing escapees and for any other shortcomings in raising the Bardu musk oxen.

I believe that the following principal factors contributed to the failure of the Bardu farm: the lack of adequate finances throughout its entire life; the absence of a clear description of the farm's animal husbandry and socio-economic purposes and a plan and timetable to achieve them, some of which INAR had agreed

contractually with Norsk Moskus A/S to do; the failure to create an organization such as Oomingmak with qualified and experienced staff to oversee the qiviut industry; the failure to generate local support; and the absence of expertise within Norsk Moskus A/S. A positive note is that the research conducted on the animals after the farm was closed yielded abundant high-quality scientific information for students of free-living and farm-raised musk oxen (Blix et al. 2011).

Acknowledgements

The author is particularly grateful to Professor Arnoldus Blix, a physiologist who has devoted his career to studying the adaptation of Arctic animals to their environment. Blix worked at the Institute of Arctic Biology at the University of Alaska in Fairbanks between 1976 and 1979 and then became the director of the Department of Arctic Biology at the University of Tromsø (now UiT The Arctic University of Tromsø). When the author first drafted this article, the author knew little about the Bardu farm, which the author visited only once and briefly. The author does not understand Norwegian, so the author could not access many sources about it, especially those in the Norwegian media. The author sent Blix my preliminary draft. Through an extensive correspondence in recent years, he kindly shared with the author his voluminous knowledge of the Bardu farm, some of which has since been published (Blix 2023). When the author later reviewed Teal's papers, the author found material presenting Teal's perspectives about matters relating to the Bardu farm that sometimes differed from Blix's version. The author has usually presented both their perspectives, since the author cannot resolve the discrepancies, and the author respects both points of view. The author is grateful also to Sigrun Robertson, Wendy Elsner, John Alden Teal and Bart Watson for information and to the staff of the Rauner Special Collections Library, Dartmouth College, Hanover, NH, for assistance in reviewing Teal's papers, including his letters and reports.

Disclosure statement

In the interests of making clear my possible bias, I disclose that I was INAR's Associate Director of Research from 1968 to 1972 and was a founder and director of the Musk Ox Development Corporation and a volunteer advisor to the Teal family in the period 1982–2021.

References

- Alendal E. 1984. Muskoxen in captivity in Europe and Asia, April 1983. In D.R. Klein et al. (eds.): *Proceedings of the First International Muskox Symposium. Biological Papers of the University of Alaska Special Report no. 4*. Pp. 9–11. Fairbanks: Institute of Arctic Biology, University of Alaska Fairbanks.
- American–Scandinavian Foundation 1970. *The American–Scandinavian Foundation Fifty-Eighth Annual Report 1969*. New York: American–Scandinavian Foundation.
- Blix A.S. 2005. *Arctic animals and their adaptations to life on the edge*. Trondheim, Norway: Tapir Academic Press.
- Blix A.S. 2023. *Eventyret Norsk Moskus A/S. Norsk Moskus (Norwegian Muskox) A/S a project like no other. Rangifer Report 15*. Uppsala: Swedish University of Agricultural Sciences. (In Norwegian with English summary.)
- Blix A.S., Ness J. & Lian H. 2011. Experiences from 40 years of muskox (*Ovibos moschatus*) farming in Norway. *Rangifer* 31(1), 1–6, doi: 10.7557/2.31.1.1691.
- Brodeur A., Leblond M., Brodeur V., Taillon J. & Côté S.D. 2023. Investigating potential for competition between migratory caribou and introduced muskoxen. *Journal of Wildlife Management* 87, e22366, doi: 10.1002/jwmg.22366.
- Bruce M. & Robertson S. 1994. An examination of the impact of the commercial use of muskox underwool upon Native Alaskan villagers. *Rangifer* 14(1), 39–44, doi: 10.7557/2.14.1.1132.
- Cooke A. & Holland C. 1978. *The exploration of northern Canada 500 to 1920. A chronology*. Toronto: Arctic History Press.
- Diubaldo R.J. 1978. *Stefansson and the Canadian Arctic*. Montréal: McGill-Queen's University Press.
- Engelstad N. 1971. Norwegian musk-ox farm. *Polar Record* 15(98), 746, doi: 10.1017/S003224740006191X.
- Griffiths H.M. 1971. Arctic handknitted one hundred per cent qiviut. *Handweaver and Craftsman* 22(2), 6–8 and 38.
- Herzog H. 2010. *Some we love, some we hate, some we eat. Why it's so hard to think straight about animals*. New York: Harper Perennial.
- Jørgensen D. 2013a. The perfect Christmas gift? The return of native Nordic fauna: a research blog exploring animal reintroduction history by Dolly Jørgensen. Accessed on the internet at <https://dolly.jorgensenweb.net/nordicnature/?p=1325> on 10 November 2020.
- Jørgensen D. 2013b. Quest for qiviut. The return of native Nordic fauna: a research blog exploring animal reintroduction history by Dolly Jørgensen. Accessed on the internet at <http://dolly.jorgensenweb.net/nordicnature/?p=248> on 10 November 2020.
- Jørgensen D. 2015. In search for the golden fleece. The return of native Nordic fauna: a research blog exploring animal reintroduction history by Dolly Jørgensen. Accessed on the internet at <https://dolly.jorgensenweb.net/nordicnature/?p=2089> on 10 November 2020.
- Jørgensen T., Traavik T., Mathiesen S.D. & Blix A.S. 1984. On contagious ecthyma and its treatment in muskoxen. In D.R. Klein et al. (eds.): *Proceedings of the First International Muskox Symposium. Biological Papers of the University of Alaska Special Report no. 4*. Pp. 182. Fairbanks: Institute of Arctic Biology, University of Alaska Fairbanks.

- Lønø O. 1960. *I Transplantation of the muskox in Europe and North-America. II Transplantation of hares to Svalbard.* Norsk Polarinstitutt Meddelelser 84. Oslo: Norwegian Polar Institute.
- Mathiesen S.D., Jørgensen T., Traavik T. & Blix A.S. 1985. On contagious ecthyma and its treatment in muskoxen (*Ovis moschatus*). *Acta Veterinaria Scandinavica* 26, 120–126, doi: 10.1186/BF03546569.
- Rutherford J.G., McLean J.S. & Harkin J.B. 1922. *Report of the Royal Commission appointed by order-in-council of date May 20, 1919, to investigate the possibilities of the reindeer and musk-ox industries in the Arctic and Sub-arctic regions of Canada.* Ottawa: F.A. Acland.
- Sandlos J. 2007. *Hunters at the margin. Native people and wildlife conservation in the Northwest Territories.* Vancouver: UBC Press.
- Schell L.C. 1972. *The musk ox underwool, qiviut: historical uses and present utilization in an Eskimo knitting industry.* Master's thesis, University of Alaska Fairbanks.
- Schultz-Lorentzen C.W. 1927. *Dictionary of the West Greenland Eskimo language. Meddelelser om Grønland* 69. Copenhagen: C.A. Reitzels Forlag.
- Shaler N.S. 1904. *Domesticated animals: their relation to man and to his advancement in civilization.* New York: Charles Scribner's Sons.
- Stefansson V. 1922. *The northward course of empire.* New York: Harcourt, Brace and Company.
- Stefansson V. 1946. Farming without barns. *Reader's Digest*, August, 85–87.
- Teal J.J. Jr. 1953. The rebirth of north Norway. *Foreign Affairs* 32(1), 123–138, doi: 10.2307/20031012.
- Teal J.J. Jr. 1954. The Norwegian musk-ox experiment. *The American–Scandinavian Review* 43, 33–36.
- Teal J.J. Jr. 1970. Operation musk ox 1969. *The American–Scandinavian Review* 58(1), 10–23.
- Wilkinson P.F. 1971. The domestication of the musk ox. *Polar Record* 15(98), 683–690, doi: 10.1017/S0032247400061787.
- Wilkinson P.F. 1972. *The relevance of musk ox exploitation to the study of prehistoric animal economies.* PhD dissertation, Department of Archaeology and Anthropology, University of Cambridge.
- Wilkinson P.F. 1974. The history of musk-ox domestication. *Polar Record* 17(106), 13–22, doi: 10.1017/S0032247400031302.