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Reindeer diseases associated with supplementary feeding in Norway and Sweden

A questionnaire-based survey

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Abstract

Climatic and anthropogenic factors are increasingly affecting reindeer husbandry in Norway and Sweden. The potential health risks associated with a warming climate, and the necessity to avoid starvation by providing supplementary feed to semi-domesticated reindeer, need to be explored and identified.

A questionnaire-based survey among reindeer herders was conducted, containing questions about the current feeding practice and reindeer diseases, such as infectious keratoconjunctivitis, contagious ecthyma and oral necrobacillosis. The survey was distributed to all reindeer districts (n=114; Norway) and Sámi villages (samebyer; n=51; Sweden) over the summer of 2021. Even though these issues have been studied in the past, there is a need for updated data on the present situation within reindeer husbandry. The main reason for this is the increase of feeding in the reindeer husbandry over the past few years.

A majority of the respondents (86.8%) in this study provided supplementary feed to their reindeer herds in the last 5 years, and 67.1 of the respondents had observed infectious keratoconjunctivitis (IKC) in their herds in the last 10 years. Warbles and botfly larvae were also common, as 76.3% of the respondents treat their herds regularly for these parasites.

The number of respondents were too limited for statistical calculations, but the findings do present indicators of the current situation. The findings of this survey can be used to create in depth interviews with reindeer herders in Scandinavia, or focused studies in regions facing challenges with disease or loss of grazing pastures.

Keywords: contagious ecthyma, feeding, herd health, IKC, Norway, oral necrobacillosis, parasites, questionnaire, rangifer, reindeer, survey, Sweden.

List of abbreviations

The list contains abbreviations used in the main text.

CE	Contagious ecthyma
CI	Confidence interval
CSI	Climate-sensitive infection
CvHV2	Cervid herpesvirus 2
IKC	Infectious keratoconjunctivitis
ORFV	Orf-virus
TBE	Tick-borne encephalitis
TBF	Tick-borne fever

1. Introduction

Eurasian tundra reindeer (*Rangifer tarandus tarandus*) are highly adapted to life in the mountains and the high Arctic. In Norway and Sweden, most reindeer are semi-domesticated, and are owned by the Sámi, indigenous people in the area. The land where the Sámi people traditionally live and herd their reindeer, is called Sápmi. This area covers the northern part of Norway, Sweden, Finland, and a small part of Russia (Figure 1).

Figure 1 – Map of Sápmi (figure modified from Wikimedia commons, original image distributed under a CC BY-SA 3.0 license)

In addition to the Sámi reindeer husbandry, there are 4 districts in Norway south of Sápmi, that are not connected to the Sámi people. These districts are known as “tamreinlag” in Norwegian (Landbruksdirektoratet(2)).

The reindeer herders today have to increasingly deal with challenges regarding conflicts of land use, such as forestry, infrastructure, and mining (Moen, 2006), which lead to fragmentation of pastures and restrict access to good pasture resources (Uboni et al., 2020). In addition, they have to deal with predators and climate change which can affect the animals access to food. Because of this, and to avoid starvation, herders are forced to increase the extent of supplementary feeding. For some herders this means going from no feeding or from restricted supplementary feeding to full feed rations over longer periods of time during the winter and spring (Tryland et

al., 2019). Therefore, this could be the beginning of a gradual switch from traditional reindeer herding towards husbandry and farming of reindeer.

Corralling and feeding may contribute to increased animal density and stress. This can cause challenging hygienic conditions at the feeding sites as well as increased risk of transmission of infectious diseases and parasites (Tryland et al., 2019).

Climate change and anthropogenic environmental changes are increasingly challenging the availability of natural resources to the indigenous communities and consequently impacting reindeer husbandry in Fennoscandia. Many northern societies will also have to deal with the complex consequences of increased exposure to climate sensitive infections, adding to the direct challenges related to reindeer health and diseases, and economy (ACIA, 2004; Evengård et al., 2021).

1.1 Climate change

The average global surface temperature has increased with 1.6°C over land and 0.88°C over the ocean, since 1850 (IPCC, 2021). The average temperature in the Arctic has increased almost at a double rate as the rest of the world (ACIA, 2004). Some Arctic plants, like mosses and lichens, are vulnerable to warming, and they are a crucial part of reindeer's diet.

In addition to temperature, precipitation has also increased in the Arctic. The increase appears to come mostly in winter and as rain, and thus can fall on top of snow (ACIA, 2004). Rain on snow, followed by freezing temperatures, may result in ice-locked pastures, which reindeer have difficulties breaking through to get to the plants underneath. It appears that the occurrences of these freeze-thaw events have increased over the recent decades. It is also predicted that the precipitation will increase even more in the next 100 years (ACIA, 2004).

Infections and diseases that are affected by climate change in any way, are known as climate-sensitive infections (CSIs). The survival and activity of infectious agents may associate directly with climatic factors (Omazic et al., 2019; Riseth et al., 2020).

1.2 Semi-domesticated reindeer

The tradition of herding reindeer within the Sámi community can be traced back to the 8th - 9th centuries A.D. (Seitsonen & Viljanmaa, 2021). Today's herding in Norway and Sweden is located within the northernmost counties of the countries. In Norway, the semi-domesticated reindeer are to be found in Finnmark, Troms, Nordland, Nord-Trøndelag, Sør-Trøndelag, Hedmark, Oppland and Sogn og Fjordane. In Sweden, they are in Norrbotten, Västerbotten, Jämtland and Dalarna (Figure 2).

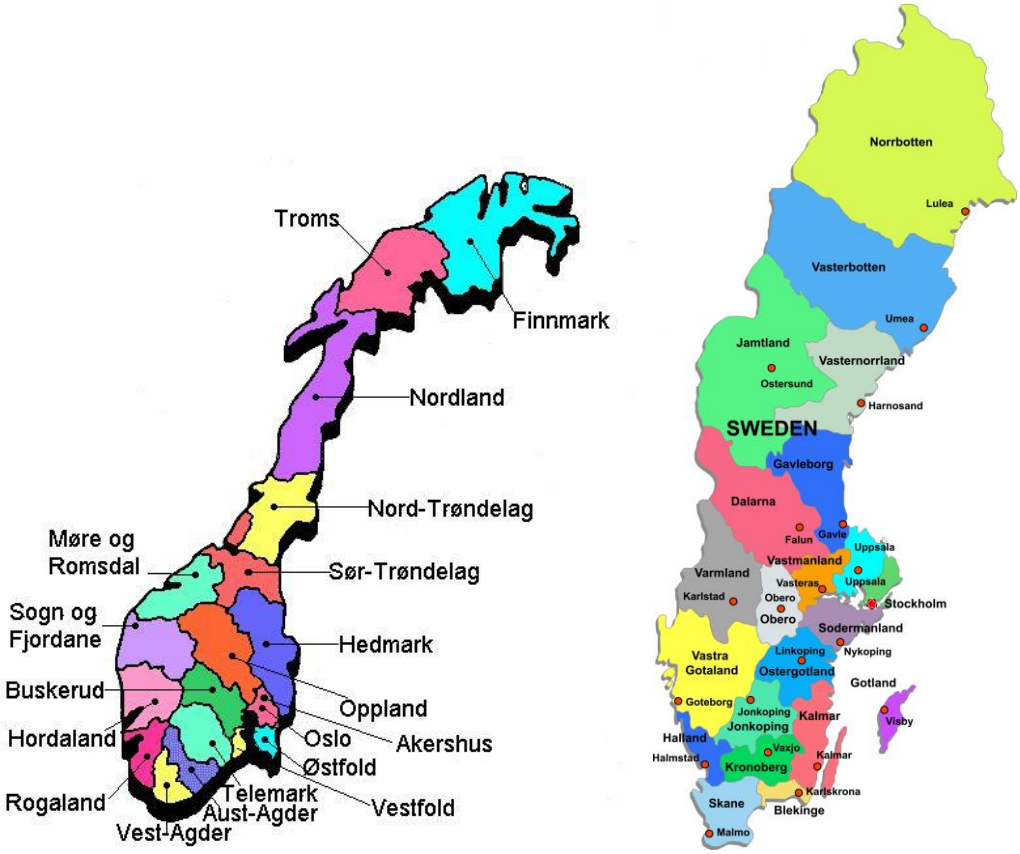

Figure 2 – Maps describing the counties of Norway (left (Pinterest.com)) and Sweden (right (Mirsch, 2011)). The counties of Norway were changed in 2020 and the ones precented in this figure are from the previous years.

Reindeer are not domesticated to the same extent as other farm animals, such as cattle and sheep, but are instead kept in a free-range setting, in which they are expected to find their own food in nature. In some areas the herders keep their reindeer in enclosures, while in other areas, the reindeer roam free in the mountains. The free-ranging animals get rounded up a few times a year, for instance for calf marking and slaughter. The herding is based on migration between summer and

winter pastures and to a large extent dependent on the traditional knowledge of the herders.

There were approximately 214 000 semi-domesticated reindeer registered in Norway in 2020 and the county of Finnmark contained about 148 000 of those reindeer (Landbruksdirektoratet). There were approximately 3200 people associated with the Sámi reindeer husbandry in Norway (Sametinget.no), from which about 2200 were in Finnmark (Regjeringen.no, 2019). Norway also has a population of wild reindeer of the same subspecies (*Rangifer tarandus tarandus*), which are managed within 24 management units in southern-Norway (Figure 3). The population of wild reindeer includes about 25 000 animals, from which approximately 10 000 are in Hardangevidda (Villrein.no).

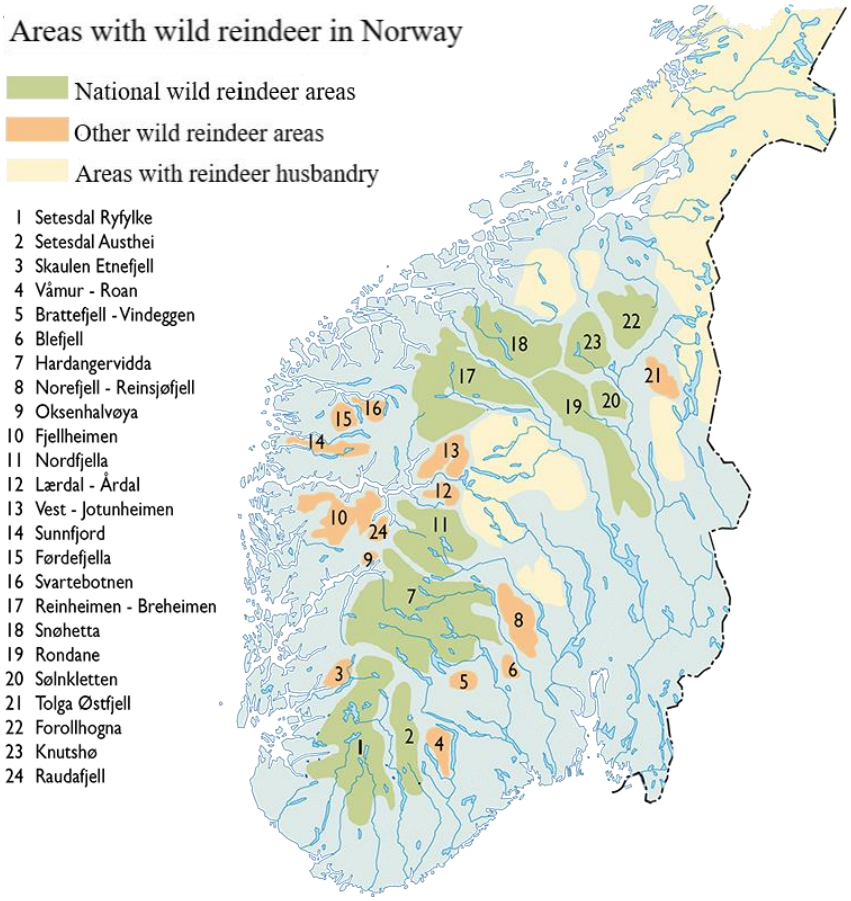

Figure 3 – Distribution of wild reindeer in Norway (Figure retrieved from (Villrein.no)). The light-yellow areas east of 8, 12 and 13 represent the tamreinlag, and the light-yellow areas approximately east of 22 and northwards are the Sámi reindeer districts.

The areas with wild reindeer do not overlap with the areas with semi-domesticated reindeer (Figure 3). Wild reindeer and semi-domesticated reindeer are of the same sub-species, and genetical studies show that there has been a mix between the two, over time (Mossing, 2019). The governing authorities has on multiple occasions released semi-domesticated reindeer to become wild reindeer, e.g., in reindeer free areas that became approved as wild reindeer areas (Rudningen, 2021).

Sweden had approximately 240 000 semi-domesticated reindeer in 2020 and about 127 000 of them were registered in the county of Norrbotten (Sametinget.se). There were approx. 4600 people connected to the Sápmi reindeer husbandry in Sweden, from which about 3100 were in Norrbotten (Sametinget.se(2)).

1.3 Supplementary feeding

Reindeer are well adapted to the conditions on the vast mountains, and up until the last few decades didn't require winter feeding. During winters with extreme amounts of snow or rain-on-snow events, which may result in ice-locked pastures (Moen, 2008; Tryland et al., 2016), reindeer can survive a short period of time by feeding on lichen that grows on trees or rocks. Today it is more practical to supplementary feed the animals to prevent starvation during hard winters (Josefsen & Tryland, 2006). If the reindeer are not used to getting fed, or if the herd is already in poor condition when the feeding starts, they develop severe digestion problems that can be fatal (e.g., rumen acidosis, diarrhea, or wet belly). A possible solution can be to feed the reindeer for a period every winter, to get them accustomed to feeding. That way the amount of feed can be increased in winters with unfavorable grazing conditions without needing to accustom the reindeer to feeding first (Josefsen & Tryland, 2006).

There are however some challenges that can occur when feeding reindeer. Reindeer can be skeptical to new types of food. This seems to apply especially for pellets. Reindeer can either learn from other reindeer that have tried the food before or be tricked into tasting it by mixing the pellets with lichens. Another issue may be the within herd ranking order, where the individuals with the highest rank get to feed first. This can lead to the lowest ranking animals not getting any food. The solution to this

is to feed the entire days ration at once, and not to divide it in two, as is normal with farm animals (Josefsen & Tryland, 2006).

When animals are fed, they eat from the same containers, and drink from the same water sources, which increases the risk for infectious disease transmission within the herd.

1.4 Reindeer diseases

Corralling, stress, increased contact between animals and challenging hygienic conditions are factors that can contribute to disease outbreaks. Some examples of diseases that may be associated with these factors are described below.

1.4.1 Infectious keratoconjunctivitis (IKC)

There have been reports of infectious keratoconjunctivitis (IKC) in Fennoscandian reindeer herds for more than 100 years (Bergman, 1912). IKC is a multifactorial disease. Some of the microorganisms that have been identified in individuals with clinical signs of the disease include bacteria from *Chlamydiaceae*, *Moraxella bovoculi* and *Mycoplasma conjunctivae* as well as reindeer herpesvirus (cervid herpesvirus 2; CvHV2) (Sánchez Romano et al., 2019). CvHV2 has been identified as a causative agent of the disease in experimental inoculations (Tryland et al., 2017), but the role of other microorganisms in the pathogenesis of IKC has not yet been completely determined.

Early signs of IKC are discoloration of the fur beneath the infected eye, and increased tear flow. More severe signs include corneal oedema, which gives the eye a blue-grey color, corneal ulcers, panophthalmitis and loss of structures of the eye, which may lead to permanent blindness (Tryland et al., 2016). IKC primarily affects young animals that have not been exposed to the disease before. It can appear sporadically in single animals, or as an outbreak in the herd.

1.4.2 Contagious ecthyma (CE)

Orf virus (ORFV; genus *Parapoxvirus*, family *Poxviridae*) is a virus that can infect reindeer but is mainly found in sheep and goats. The virus is zoonotic and can infect humans (Tryland, Das Neves, et al., 2018). ORFV causes the disease contagious ecthyma in reindeer, which can be characterized as proliferative “cauliflower-like” lesions at the junctions of skin and mucosal membranes, especially of the mouth and nose, as well as inside the mouth in the oral mucosa (Tryland et al., 2019). Outbreaks in Finland have also been associated with *Pseudocowpoxvirus*, which is a related parapoxvirus that is primarily associated with cattle (Tikkanen et al., 2004).

An early sign of CE is that the animal can be found with food in its mouth, without being able to chew, which can lead to starvation (Tryland, Ravolainen, et al., 2018). It is likely that the infection’s origin is associated with infected sheep or goats that graze the same pastures as the reindeer, or when corrals and transport vehicles previously used for sheep is being used for reindeer (Tryland et al., 2006).

1.4.3 Oral necrobacillosis

Oral necrobacillosis is caused by the bacterium *Fusobacterium necrophorum*. The bacterium is part of the reindeer’s normal microbiota and can be found in the rumen and feces (Tryland et al., 2019). Outbreaks of the disease used to occur when reindeer were corralled for milking, a practice that was stopped in the 1950s. Today’s outbreaks usually occur when the corrals are wet and the hygienic conditions are poor, and the disease is only seen in semi-domesticated reindeer (Tryland et al., 2019). Clinical signs of oral necrobacillosis consist of increased salivation and problems with chewing, with wounds in the mouth or cheeks with pus formation and necrosis of the oral mucosa (Tryland et al., 2019).

1.4.4 Parasites

Hypoderma tarandi is a botfly (also known as warble fly) that lays its eggs on hairs on the reindeer’s fur. When the larvae hatches, it makes its way through the skin and positions itself in the subcutaneous tissue, where it slowly develops over the winter. When it is fully grown in the spring, it comes out through a breathing hole in the skin

that it previously made and falls to the ground where it goes through pupation to become an adult botfly (Josefsen et al., 2006).

Cephenemyia trompe is also a botfly (also known as a nose bot fly). *C. trompe* does not lay eggs but gives birth to larvae that it sprays directly into the nostrils or mouth of the reindeer. The larvae have hooks that allows them to attach themselves to the mucosa, preventing the reindeer from sneezing them out. The larvae crawl further back to the mucosa in the pharynx, where they develop to full size. The reindeer coughs up the fully grown larvae in the spring (May-June), which falls to the ground where they undergo pupation and mature into adult flies (Josefsen et al., 2006).

Elaphostrongylus rangiferi known as brainworm or meningeal worm is a protostrongylid nematode that infects reindeer. This parasite has an indirect life cycle and uses gastropods (snails and slugs) as intermediate hosts. The development of the parasite in the gastropods is highly temperature sensitive, making brainworm a climate sensitive infection. Once the reindeer have ingested an infected gastropod, the *E. rangiferi* larvae make their way through the wall of the gastrointestinal tract and migrate around the body through the bloodstream. Only the larvae that make it to the central nervous system will survive and develop further into adults. Usually, the reindeer are not very affected by this parasite, but it seems that heavy infections, when the reindeer gets infected by many larvae at the same time, can result in serious neurological disorders, where the animals lose their balance and have difficulty standing up. It can also result in paralysis in their legs (Josefsen et al., 2006). Outbreaks of *E. rangiferi* have been linked to high summer temperatures in the previous years. This means that increasing temperatures in summer will increase the risk of severe outbreaks (Rose Vineer et al., 2021).

Ticks (e.g., *Ixodes ricinus*) are ectoparasites that do not thrive in cold temperatures. The females feed on the blood of mainly mammals and birds. It has been argued that the distribution of *I. ricinus* has increased further north in Norway (Jore et al., 2011), while others argue against it, claiming that it is uncertain if the ticks have established populations above the Arctic circle, or if those individuals found in the north were transported there by migratory birds or mammals (Soleng et al., 2018). Ticks can carry diseases such as Lyme borreliosis, tick-borne encephalitis (TBE), and tick-borne fever (TBF). Borreliosis is a disease that affects humans and animals and is

caused by the bacterium *Borrelia burgdorferi*. Amongst the domesticated animals in Norway, the disease primarily develops in dogs (Vetinst.no & NVI). TBE mainly affects humans, however there have been reported clinical cases in dogs and horses (SVA, 2020). TBE-virus can infect domesticated ruminants, but they don't show any clinical signs of the disease. The TBE-virus can however be transmitted through the milk and infect humans that drink it unpasteurized (Paulsen et al., 2018). TBF is caused by the bacterium *Anaplasma phagocytophilum*. Clinical cases have been recorded in multiple species of mammals, including humans and reindeer (Stuen, 2007).

1.4.5 Other diseases

Wet belly

A clinical sign of wet belly is wet fur on the ventral surface of the reindeer, spreading over the thorax, abdomen and down the legs. The cause of wet belly is unknown but is known to be associated with feeding. It has been established that the disease in not associated with any specific feedstuff or feeding regime (Åhman et al., 2018).

Diarrhea

Like wet belly, diarrhea is highly likely to be associated with feeding. It is most likely to occur with the use of pellets but can also occur in connection with high-fiber feed mixtures (Åhman et al., 2018).

Ruminal acidosis

Rippling belly and water belly are the common names of the condition ruminal acidosis. It is a condition where a splashing sound is heard from the abdomen of reindeer when they move or when the abdomen is pressed (Laaksonen, 2018). The risk of rippling belly decreases if the reindeer feed on good silage in combination with pellets. This can stimulate rumination and production of saliva, which can prevent the content of the rumen to become too acidic (Rockström, 2019).

2. Aim of study

The aim of this study was to identify potential health effects that could be associated with the increased feeding of reindeer, and at the same time improve our understanding of relationships between feeding practice, hygienic conditions (corrals) and risk factors for disease outbreaks.

In order to accomplish this, we distributed a questionnaire-based survey, to every reindeer district and Sámi village associated with reindeer husbandry in Norway and Sweden, to gather information on reindeer disease outbreaks that have been associated with increased feeding.

This project will increase our understanding of the infection biology of the diseases that are directly or indirectly associated with feeding of reindeer, and aid in reducing negative impact from diseases on animal welfare, herding management and economy. The multidisciplinary questionnaire, presenting pictures and questions about feeding and reindeer diseases, represents an important communication platform between scientists and stake holders which addresses historical knowledge as well as present practices and experiences. This project may also reveal important research gaps that will need to be addressed in future studies.

3. Methods

To be able to learn about the potential health effects in reindeer, an online questionnaire was conducted in Questback (Stockholm, Sweden; (Questback.com)), and distributed to all reindeer districts in Norway and Sweden. The questions were originally designed in Swedish and translated to both Norwegian and North Sámi. Multiple personnel from multiple organizations were included in the project from the beginning and could contribute questions to the survey. These were personnel from UiT Arctic University of Norway (Tromsø), Norwegian Research Centre (NORCE), Norwegian Institute for Nature Research (NINA), Norwegian Veterinary Institute (NVI, Tromsø), Norwegian Institute of Bioeconomy Research (NIBIO), Nordland Research Institute (NRI, Bodø), National Veterinary Institute – Sweden (SVA) and Swedish University of Agricultural Sciences (SLU).

A permit for safe handling and storing of data was approved by the Norwegian Centre for research data (NSD; approval number 457339). No permit was needed in Sweden. The participants were given written information and written informed consent was obtained. Only a few selected people will have access to voluntarily specified personal data.

All responses to the survey were anonymous. The last question of the survey was asking if they were willing to do a follow-up interview. If they responded positively to this question, they were taken to a separate site, not connected to the original survey, where they could send in their contact information (the interviews are not within the scope of this thesis).

The questionnaire consisted of 139 questions, divided between sections about general demographics, disease (IKC, CE, oral necrobacillosis and other diseases, including parasites), and feeding. Some sections could be skipped, e.g., the disease sections started with a question asking if the respondent had ever seen the disease in question. If the respondent answered “no”, they would be directed to the next section of questions.

In Norway, the contact information to the Norwegian reindeer districts (114 in total), was collected from the websites of the county governors, within each relevant county.

The questionnaire was sent to the leader of each district, with a request for them to distribute it to all the herders within the district.

In Sweden, the questionnaire was distributed through Svenska Samernas Riksförbund (SSR), by sending it to the chairmen of all the Sámi villages (51 in total). In addition to that, most of the chairmen were contacted by phone, to remind them to respond to the survey and to spread it among all members of the village. All herders that had previously been in contact with SVA regarding their projects, were also personally contacted by phone or email. In addition, SSR posted the link to the survey on their webpage for their members.

The distribution of the survey could potentially reach every person associated with reindeer husbandry, which adds up to approximately 7800 people in Norway and Sweden.

The questionnaire was open for response from April 16th to September 6th, 2021, and reminders were sent on a regular basis (approximately every 4-6 weeks) in both countries. A couple of weeks before closing the survey, it was also posted in private Facebook groups for reindeer herders both in Norway and Sweden. A last reminder was sent one week before the survey closed.

In addition to 76 completed answers to the survey, there were 123 uncompleted answers. Since all respondents answered the survey anonymously and because the respondents could not store uncomplete surveys to be finished at a later time, it was unknown if a single respondent could be connected to multiple uncomplete responses. Therefore, the uncomplete questionnaires were discarded for the time being, but they may be analyzed in a future project.

The focus of this thesis was the questions addressing risk factors for disease outbreaks. The questions that were selected to be analyzed, were mainly concerning disease occurrence and outbreaks, and if feeding could be a risk factor for disease.

The data was stored in Questback and exported to .xlsx, .pptx and .pdf for processing. The .pptx and .pdf file contained complete bar charts for each question. To process the dataset, the statistical computer program StataMP 17 (Stata Nordic Consulting AB, Stockholm, Sweden) (Stata.com) was used. Demographic data and

data from other questions were tabulated to extract the exact number of responses. Bar charts were created for herd size distribution in both Norway and Sweden.

Confidence intervals (CI) were calculated, using a sample size calculator (UCSF). By comparing CIs and seeing if they overlap, it could be stated if the difference was significant. Overlapping intervals were concluded not to be statistically significant, and if there was no overlap, the difference was concluded to being significant.

4. Results

A total of 76 herders responded to the questionnaire with 33 respondents from Norway and 43 from Sweden (Table 1). Most of the respondents were male herders (n=46, 60.5%) and the most represented age range was 40-59 years old (n=43, 56.6%). The majority had a herd size of 500-999 (n=17, 22.4%), 1000-1999 (n=16, 21.0%) or 2000-2999 (n=16, 21.0%) animals.

There were respondents from all the regions of reindeer herding in both countries, except Møre og Romsdal in Norway (Table 2). However, in many cases the number of respondents were low and therefore further analysis of geographical variation was restricted to country level comparisons. The counties with the highest number of respondents, were Vest-Finnmark in Norway and Norrbotten in Sweden.

Table 1 – General demographic data from the questionnaire "How will increased feeding of reindeer affect health, disease and traditional reindeer husbandry?", 2021. The numbers represent the number of respondents for each category.

Parameter	***Category***	***Norway***	***Sweden***	***Total number***
Respondents		33	43	76
Gender	Female	6	21	27
	Male	27	19	46
	Not specified	0	3	3
Age	<20	0	0	0
	20-39	9	13	22
	40-59	19	24	43
	>60	5	6	11
Herd size	<50	0	2	2
	50-99	0	2	2
	100-249	4	4	8
	250-499	9	2	11
	500-999	6	11	17
	1000-1999	4	12	16
	2000-2999	9	7	16
	>3000	1	3	4

Table 2 – Geographical distribution of the respondents that answered the questionnaire "How will increased feeding of reindeer affect health, disease and traditional reindeer husbandry?", 2021.

Region Norway	***Number of respondents***	***Percentage***
Øst-Finnmark	7	21
Vest-Finnmark	10	30
Troms	5	15
Nordland	5	15
Nord-Trøndelag	1	3
Sør-Trøndelag	2	6
Møre og Romsdal	0	0
Hedmark	3	9
Total	**33**	**100**

Region Sweden	***Number of respondents***	***Percentage***
Dalarna / Jämtland	7	16
Norrbotten	24	56
Västerbotten	12	28
	43	**100**

Out of the answers from the survey, Sweden had the smallest herds, but also contained a higher number of herds in the size range of 500-1999 animals, than Norway (Figure 4). Although Sweden had a high number of herds within the range of 2000-2999 animals, Norway had a higher number og herds in that specific size range. Norway's peaks were within the size ranges of 250-499 and 2000-2999 animals.

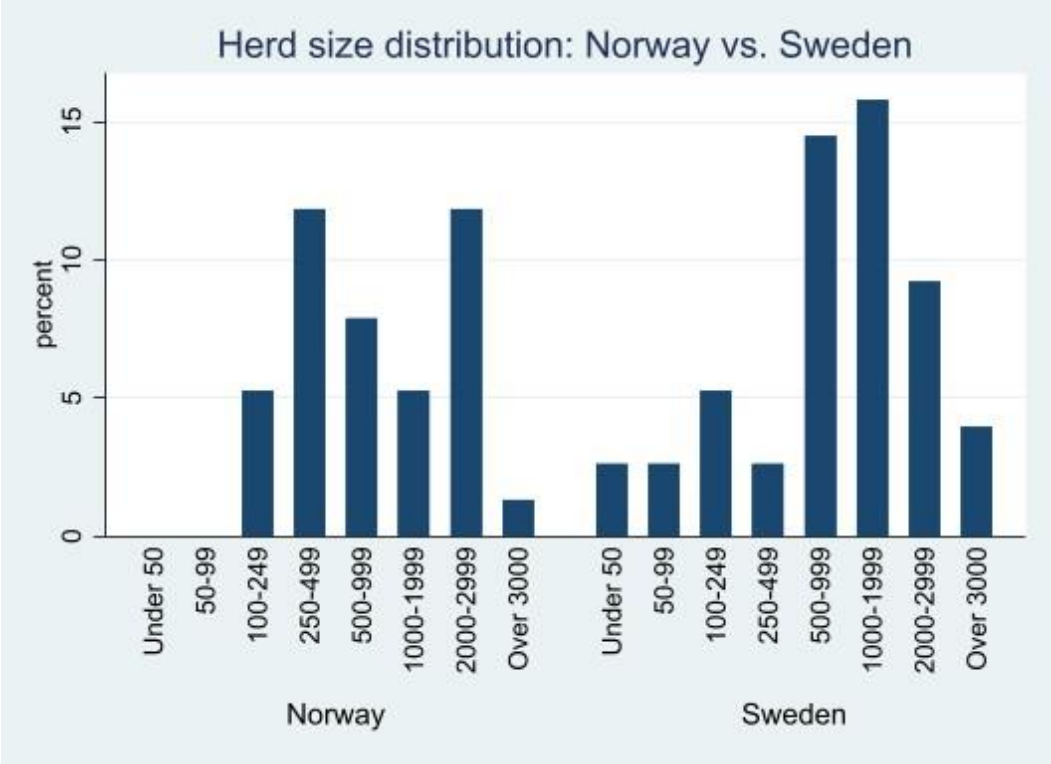

Figure 4 – The distribution of herd sizes in Norway and Sweden, according to the answers from Norwegian and Swedish semi-domesticated reindeer herders.

Figure 5 shows that the highest number of answers from Sweden was from Norrbotten county. Norrbotten county also contained the widest distribution of herd sizes, with herds from under 50 to more than 3000 animals, and with the highest number of herds in the size range of 1000-1999 animals. Dalarna/Jämtland counties were only represented by herders with herds in the size range of 500-2999 animals. Västerbotten county had a slightly higher range of herd sizes ranging from 100-over 3000 animals.

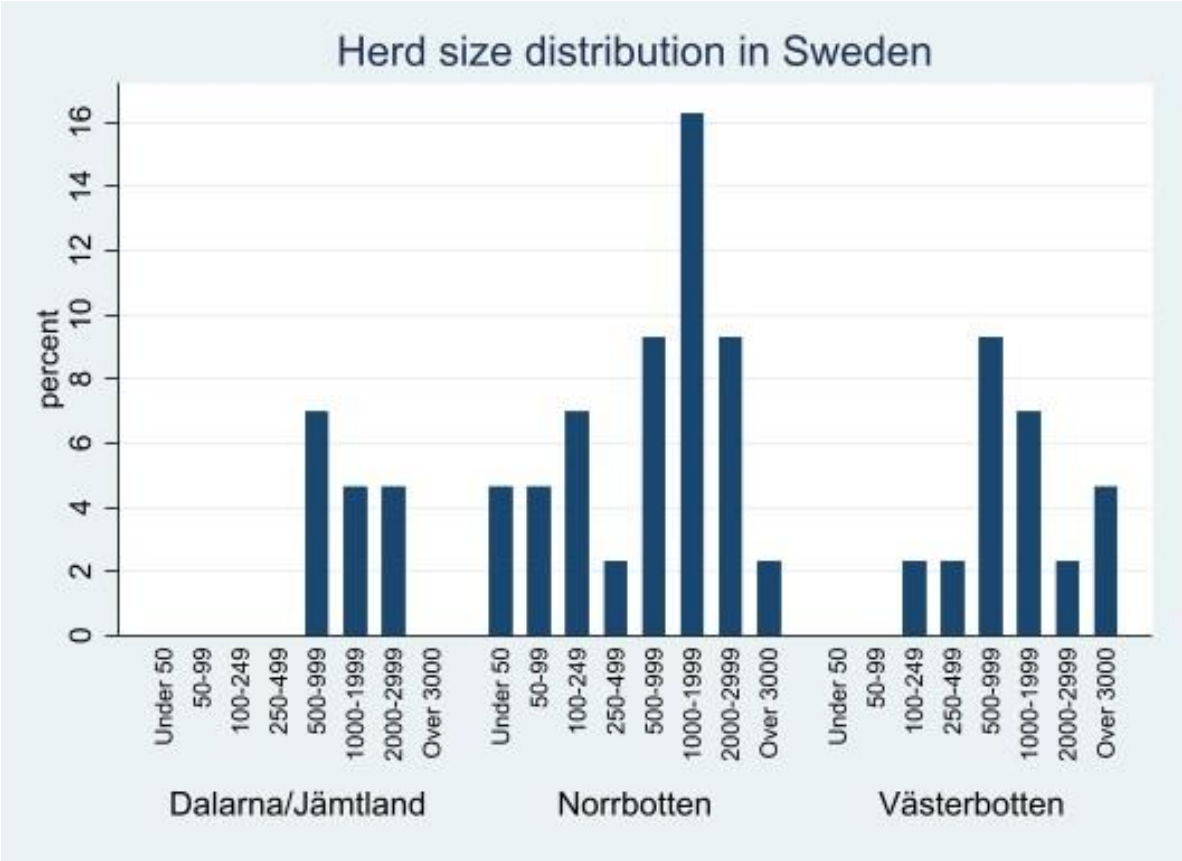

Figure 5 – The distribution of herd sizes within the regions of Sweden, according to the answers from Swedish semi-domesticated reindeer herders.

As the response was low in most of the counties in Norway, there is limited data on the herd sizes within these counties (Figure 6). According to the response to the survey, Vest-Finnmark held herds within the size range of 250-over 3000 animals, of which most herds were within the range of 2000-2999 animals. Øst-Finnmark on the other hand, held herds within the size range of 100-1999 animals.

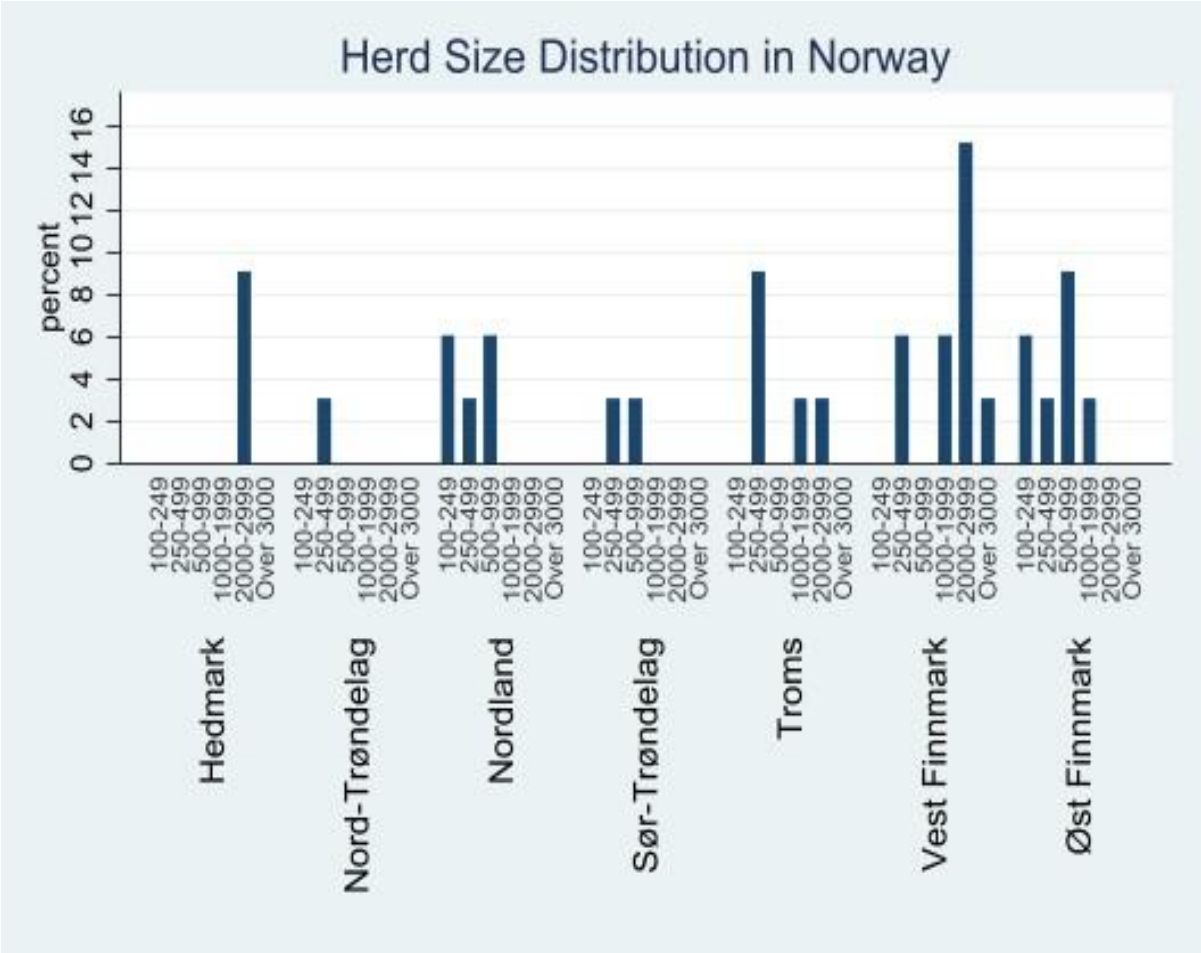

Figure 6 – The distribution of herd sizes within the regions of Norway, according to the answers from Norwegian semi-domesticated reindeer herders.

4.1 Infectious keratoconjunctivitis (IKC)

All participant (n=76) answered the question regarding the appearance of IKC in their herds in the last 10 years. 51 herders (67.1%) claimed to have seen clinical signs of IKC in the last 10 years (Figure 7), while 22 (28.9%) didn't see any of the clinical signs and three (3.9%) were not sure or had seen other changes in the eyes of their reindeer.

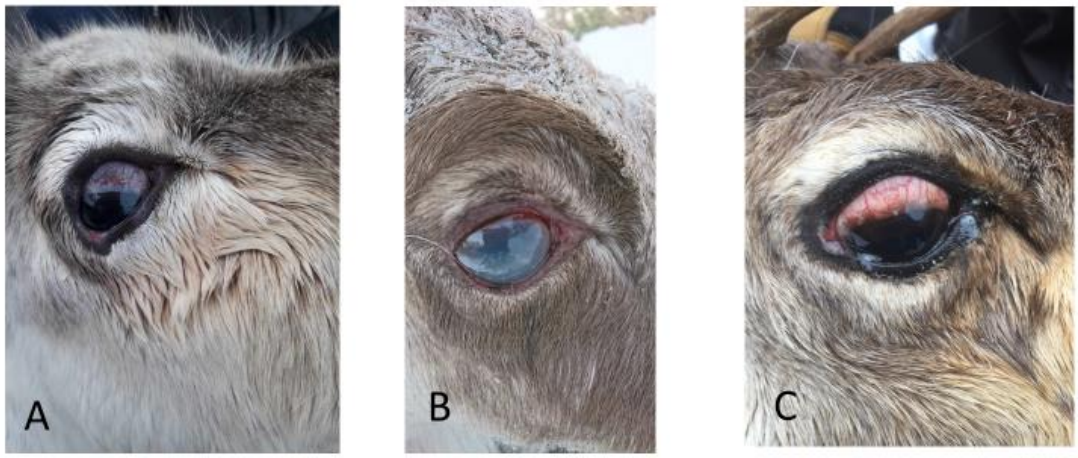

Figure 7 – Figure presented in questionnaire, for the respondents to get a better understanding of which disease and clinical signs they were being asked about. A: Lacrimation, making the fur under the eye moist – early stage. B: Blue-grey cornea and red mucosa, increasing symptoms. C: Red mucosa, swollen eye, persistent tear flow, increasing symptoms.

In Norway, 20 of the 33 respondents reported seeing IKC in the last 10 years. This constitutes of 60.6% [95% confidence interval (CI): 43.9-77.3 %] of the herders in Norway. In Sweden, 34 out of 43 respondents, or 79.1% [95% CI: 66.9-91.2 %], had seen IKC in the last 10 years.

Herders that answered "Yes" or "I don't know/Other changes" (n=54) got to answer the remaining questions about IKC, while the herders that answered "no" skipped ahead to the next topic.

A total of 34 herders (63.0%) had seen IKC in the past year, of which 11 answered from Norway (33.3% of the total number of 33 herders) and 23 from Sweden (53.5% of the total number of 43 herders). Eleven herders (20.4%) had seen IKC in the past 5 years, of which five were answers from Norway and six from Sweden.

Case A (Increased lacrimation and discoloration of the fur under the eye) (Figure 7) of IKC had the most reported cases that occurred often (n=11, Table 3). While Case B (Corneal oedema) had the highest number of reported cases that occurred sometimes (n=44), followed by Case A, with 36 reports (Table 3).

Table 3 – Distribution of answers from Norwegian and Swedish semi-domesticated reindeer herders regarding which stage of infectious keratoconjunctivitis (IKC) was usually observed in the affected reindeer.

	A *Lacrimation, discoloration of fur under eye*	**B** *Corneal oedema*	**C** *Pink eye / Conjunctivitis*	**Other**
Never	3	7	28	15
Sometimes	36	44	19	5
Often	11	2	0	0
Total	*50*	*53*	*47*	*20*

The majority of herders that reported IKC outbreaks, reported seeing them in winter and fall in all age classes (Figure 8). A minority reported seeing them all year round or in spring. Interestingly, no clear trend of being enclosed or free-range with or without feeding was seen for IKC outbreaks (Figure 9 ; Table 4). The opinion also seemed to be divided as to whether the incidence of IKC had changed during the previous 5 years, but a majority of the herders (n=23; 42.6%) stated that they didn't see a change in the IKC incidence (Figure 10; Table 5). Treatment of the condition also varied between herders, including answers from separation of infected individuals (n=20; 37.0%) to a variety of medical treatments (Figure 11), with the most common option being slaughtering the animals (n=30; 55.6%).

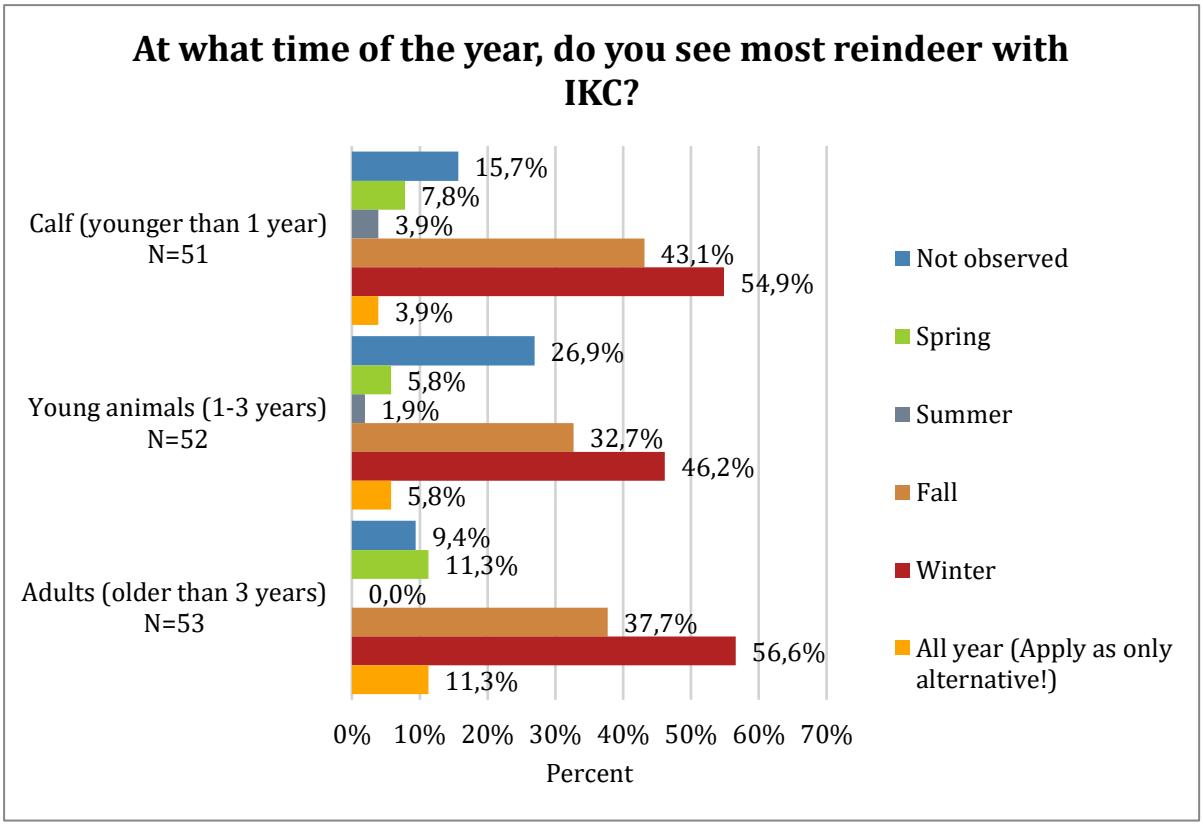

Figure 8 – Answers from semi-domesticated reindeer herders regarding the period of the year in which cases of infectious keratoconjunctivitis (IKC) could be observed within their herds and divided into different reindeer age groups. N is the total number of respondents that chose this alternative.

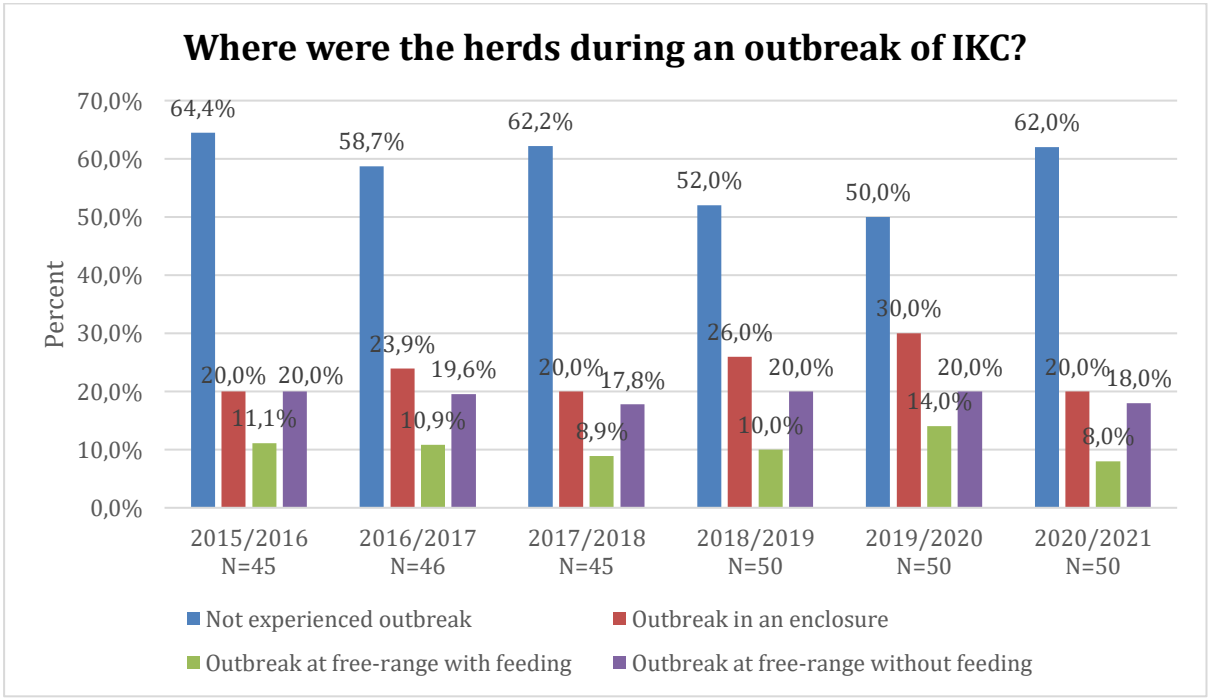

Figure 9 – Answers from semi-domesticated reindeer herders regarding the location in which outbreaks of infectious keratoconjunctivitis (IKC) could be observed within their herds, for every season between 2015-2021. Outbreaks are defined as a clear increase in the number of cases over a given period of time, such as more affected animals than usual during a season, or over a shorter period of time, such as weeks. N is the total number of respondents that answered for each season.

Table 4 – Distribution of answers from Norwegian and Swedish semi-domesticated reindeer herders regarding the location in which they experienced outbreaks of infectious keratoconjunctivitis (IKC) during the season 2020/2021. Outbreaks are defined as a clear increase in the number of cases over a given period of time, such as more affected animals than usual during a season, or over a shorter period of time, such as weeks.

	Norway	Sweden	Total
Not experienced outbreak	12	19	31
Outbreak in an enclosure	4	6	10
Outbreak at free-range with feeding	1	3	4
Outbreak at free-range without feeding	4	5	9

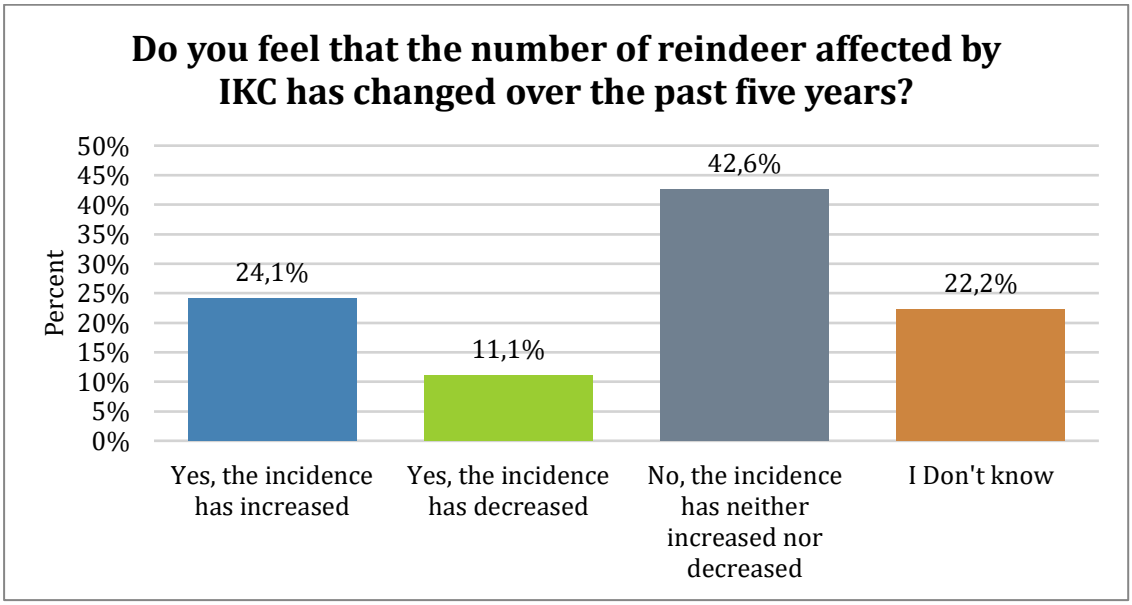

Figure 10 – Answers from 54 semi-domesticated reindeer herders regarding observed change in numbers of reindeer affected by infectious keratoconjunctivitis (IKC) over the past 5 years.

Table 5 – Distribution of answers from Norwegian and Swedish semi-domesticated reindeer herders regarding changes in numbers of reindeer affected by infectious keratoconjunctivitis (IKC) over the past 5 years. The numbers in the table represent the number of respondents for each alternative.

	Norway	Sweden	Total
Increase	1	12	13
Decrease	3	3	6
No change	9	14	23
I don’t know	7	5	12

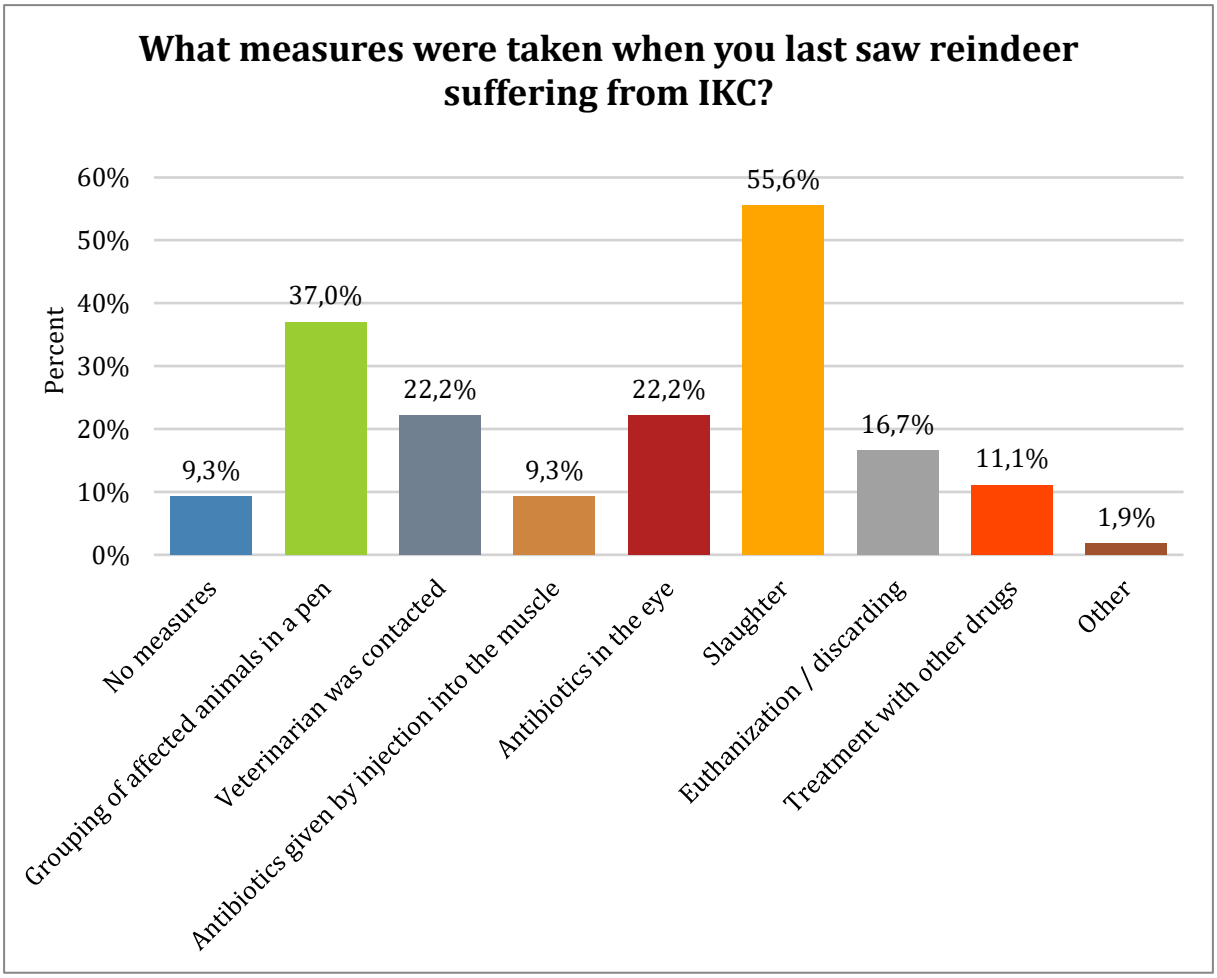

Figure 11 – Distribution of answers from 54 Norwegian and Swedish semi-domesticated reindeer herders regarding which measures were taken during the last observation of reindeer affected by infectious keratoconjunctivitis (IKC). Each respondent could choose multiple answers.

4.2 Contagious ecthyma

All 76 respondents replied to the question in which they were asked if they had seen clinical signs of contagious ecthyma (CE) in the past 10 years (Figure 12). Eight herders (10.5%) answered yes (two herders in Norway and six herders in Sweden), and two herders weren't sure (both in Sweden). The remaining respondents (n=66) declared that they had not seen clinical signs of CE in their herds. The respondents that answered "yes" or "unsure" were presented with follow-up questions about CE.

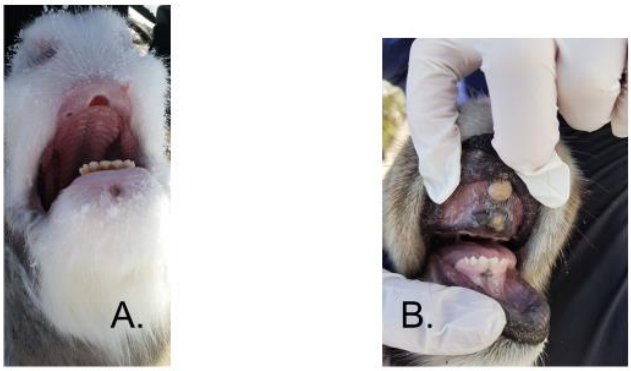

Figure 12 – Figure presented in questionnaire, for the respondents to get a better understanding of which disease and clinical signs they were being asked about. A: Erosion/sore in the mucosa in the oral cavity and lip caused by Orf virus, early stage. B: Fast growing proliferative processes in the oral cavity and gums. Later stage.

Of the two herders that saw CE in the past year (Figure 13), one was located in Sør-Trøndelag in Norway and the other in Norrbotten in Sweden, while the four herders that saw clinical symptoms of the disease in the past 5 years were all located in Sweden (Norrbotten and Västerbotten). The remaining respondents answered that the last time they saw clinical symptoms of CE was more than 5 years ago (n=2) or they were not sure (n=2).

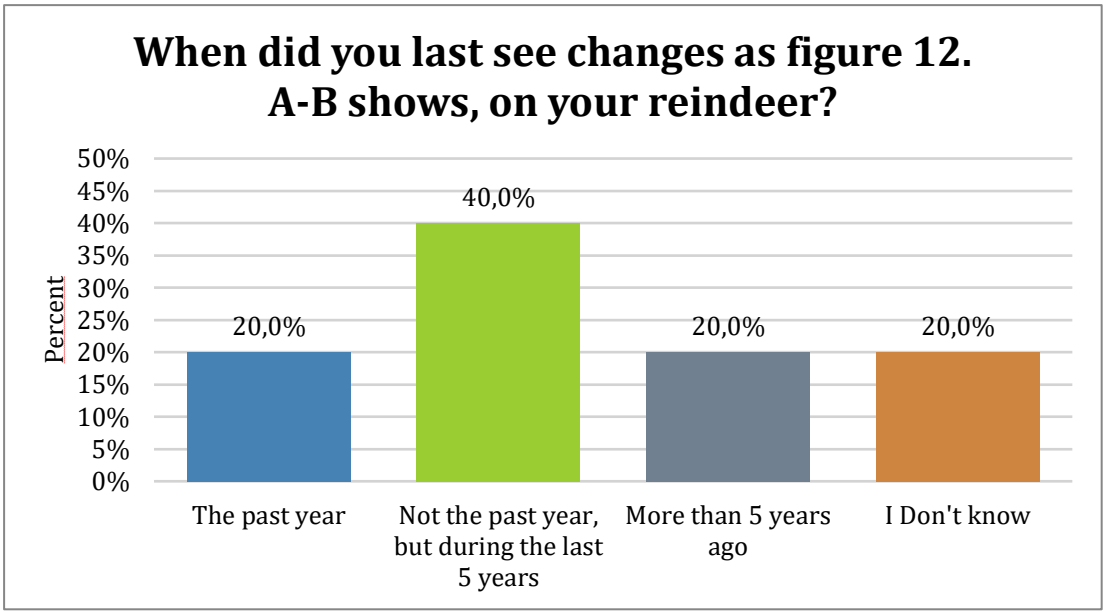

Figure 13 – Answers from 10 semi-domesticated reindeer herders regarding the last time they observed contagious ecthyma (CE) in their reindeer herds.

4.3 Oral necrobacillosis

All 76 respondents answered the question in which they were asked if they had seen clinical signs of oral necrobacillosis in the past 10 years (Figure 14). Nineteen herders (25.0%) answered yes (three herders in Norway and 16 herders in Sweden). The remaining respondents (n=57) declared that they had not seen clinical signs of oral necrobacillosis in their herds. The respondents that answered “yes” were presented with follow-up questions about oral necrobacillosis.

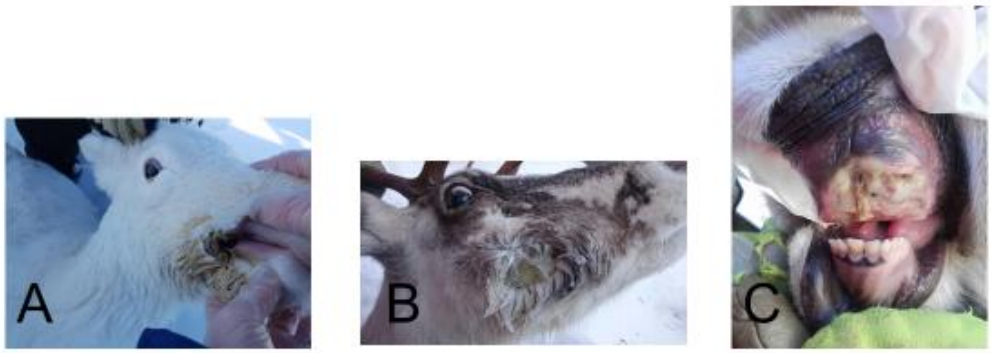

Figure 14 – Figure presented in questionnaire, for the respondents to get a better understanding of which disease and clinical signs they were being asked about. A: Wounds and soiled mouth/cheeks with pus formation. B: Infection in the cheek where there has been developed a permanent hole in the cheek. C: Infection of the gums with pus formation.

All six herders that observed oral necrobacillosis in the past year (Figure 15), were located in Sweden; four were located in Norrbotten, one in Västerbotten and one in Dalarna/Jämtland. Out of the 10 herders that saw clinical signs of the disease in the past 5 years, one was located in Norway (Troms), and nine in Sweden (four in Norrbotten and five in Västerbotten). The remaining respondents answered that the last time they saw clinical signs of oral necrobacillosis was more than 5 years ago (n=3).

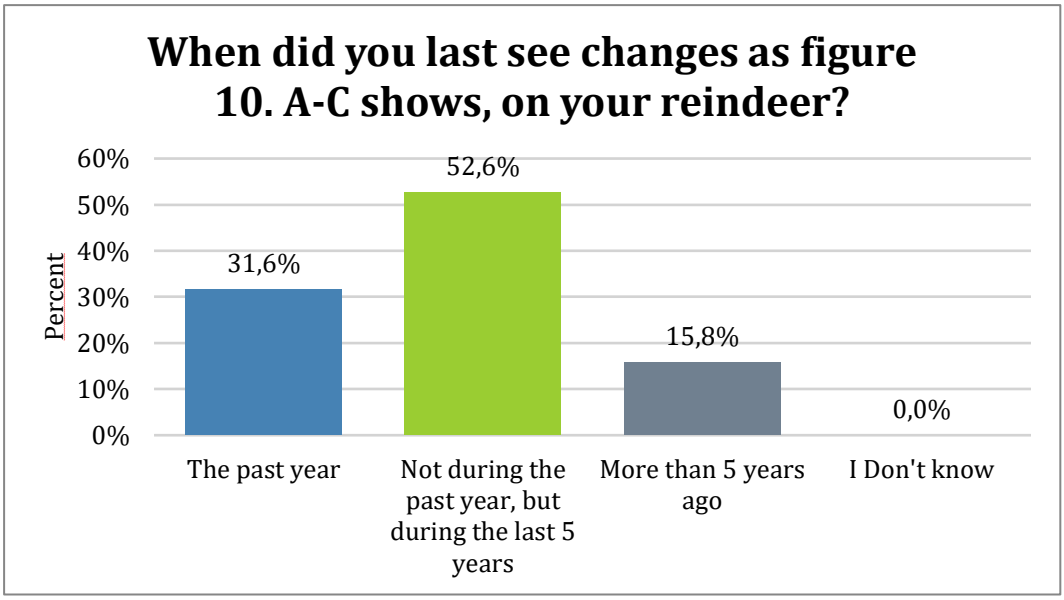

Figure 15 – Answers from 19 semi-domesticated reindeer herders regarding the last time they observed oral necrobacillosis in their reindeer herds.

4.4 Other diseases

All 76 respondents were presented with a question where they could state any other diseases, which they may have observed in their herd from the winter season of 2019/2020 until the day they answered the survey (Table 6). Forty-six herders (60.5%) had seen parasites and 43 herders (56.6%) had encountered diarrhea and abortion of fetuses. Four herders (5.3%) commented that they had seen pneumonia in their reindeer (Included as “Others” in Table 6).

Table 6 – Distribution of answers from Norwegian and Swedish semi-domesticated reindeer herders regarding which diseases they had observed from the winter of 2019/2020, until the day they answered the questionnaire (2021). All 76 respondents could choose multiple answers.

Diseases	**Percentage** (of all 76 responses)	**Number of responses**	**Norway** (Number of herders)	**% ** Norway**	**Sweden** (Number of herders)	**% *** Sweden**
Parasites*	60,5	46	19	57,6	27	62,8
Abortion of fetus	56,6	43	16	48,5	27	62,8
Diarrhea	56,6	43	11	33,3	32	74,4
Emaciation	31,6	24	11	33,3	13	30,2
Wet belly	30,3	23	4	12,1	19	44,2
Rippling belly	25,0	19	7	21,2	12	27,9
No known cause of death	23,7	18	8	24,2	10	23,3
Uterine prolapse	21,1	16	8	24,2	8	18,6
Brainworm (*Elaphostrongylus rangiferi*)	18,4	14	6	18,2	8	18,6
Instability / limping	14,5	11	5	15,2	6	14,0
Bloat	9,2	7	2	6,1	5	11,6
None of the listed diseases	7,9	6	3	9,1	3	7,0
Others****	6,6	5	1	3,0	4	9,3

**Parasites like* Hypoderma tarandi*,* Cephenemyia trompe*, intestinal parasites, other skin/fur parasites.*
***Percentage of Norwegian responses to each disease, out of the total of Norwegian responses (n=33)*
****Percentage of Swedish responses to each disease, out of the total of Swedish responses (n=43)*
*****When choosing others, herders where able to submit a written answer stating the disease they observed*

The 76 respondents were asked if they regularly treat against botfly larvae. Fifty-eight herders (76.3%) answered “yes”, of which 23 herders were from Norway and 35 from Sweden. The remaining 18 respondents that did not treat for botfly larvae (10 herders from Norway and eight herders from Sweden), skipped to the next section.

Fifty-seven of 58 respondents answered in which season(s) they performed treatment against botfly larvae, and they could choose multiple seasons. Forty herders (70.2%) treated in Fall, 34 herders (59.6%) treated in winter, one herder (1.8%) treated in Spring, and none treated during the Summer.

A majority of the 58 herders that treated for botfly larvae, treated a combination of live calves (calves that are not to be taken to slaughter), bulls and cows (n=50; 86.2%). Two herders in Norway (3.4%) only treated live calves, and six herders (10.3%) selected the alternative “other”.

All 76 respondents were asked if they had seen ticks on their reindeer (Figure 16). The majority (n=69; 90.8%) had not seen ticks. Two herders (2.6%) had seen ticks, and five herders (6.6%) were unsure. The two herders that had seen ticks were located in Nordland and Sør-Trøndelag counties in Norway. Of the five herders that were unsure, one was located in Hedmark county in Norway, one in Dalarna/Jämtland and three in Norrbotten counties in Sweden.

Figure 16 – Figure as presented in the questionnaire for the respondents to recognize which ectoparasite they were asked about. Ticks, Ixodes ricinus*. A: Blood-filled female. B: Female tick on a blade of grass.*

4.5 Feeding

All 76 respondents were asked if they had provided emergency or supplementary feeding to their winter herd at any time during the last 5 years. Sixty-six herders (86.8%) answered “yes”, and 10 herders (13.2%) answered “no”.

The majority of the regions contained more herders that provided supplementary feed rather than herders that did not provide supplementary feed (Figure 17). The exceptions were Hedmark and Nord-Trøndelag counties in Norway, were none of the respondents provides supplementary feed to their herd.

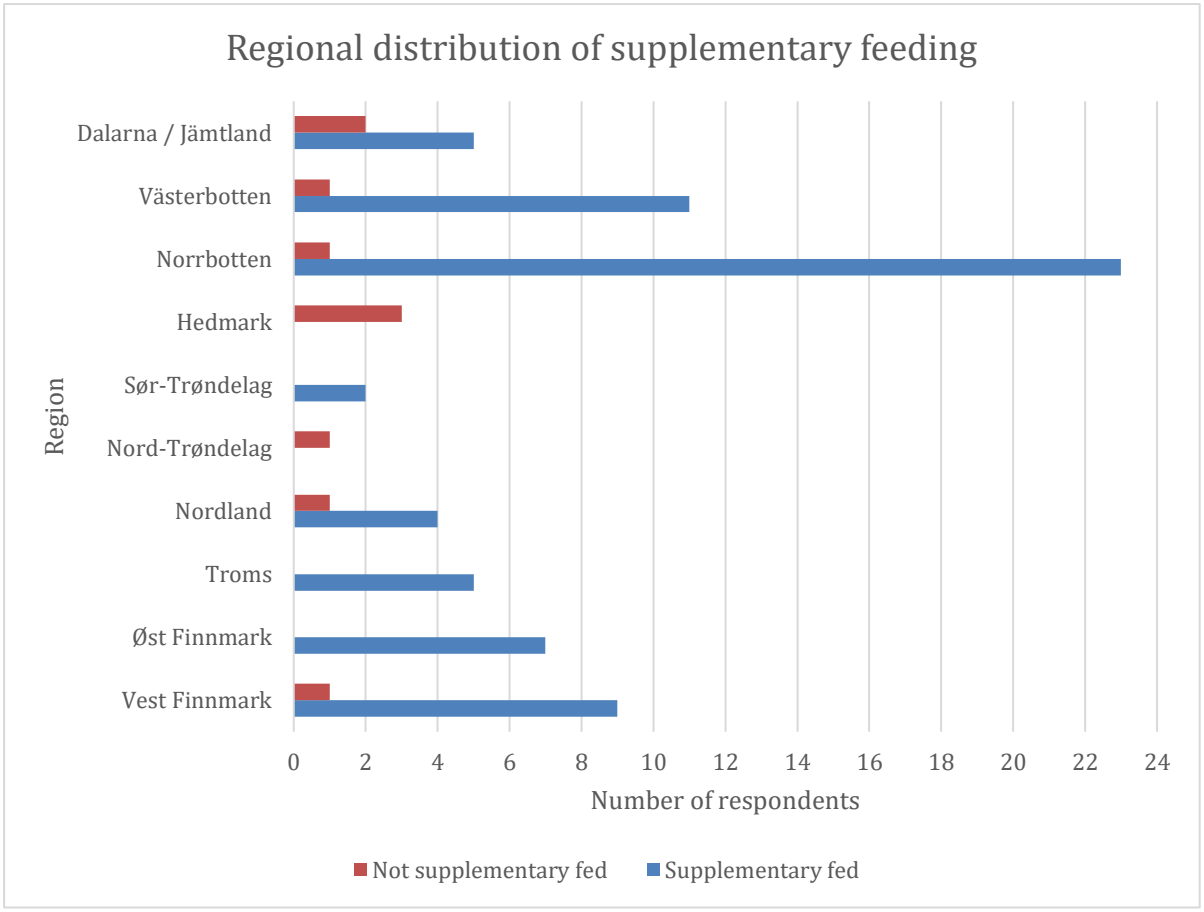

Figure 17 – Geographical distribution of answers from Norwegian and Swedish semi-domesticated reindeer herders regarding if they had provided supplementary (or emergency) feed in their winter herds in the past 5 years.

When asked the type of location in which reindeer were fed, in each winter season from 2015-2021, the majority answered, “fed at free range” (Figure 18, Table 7). Of the 44 herders that fed at free range, 27 were in Sweden and 17 in Norway. Of the 28 herders that fed in enclosures, 24 were in Sweden and four in Norway (Table 7).

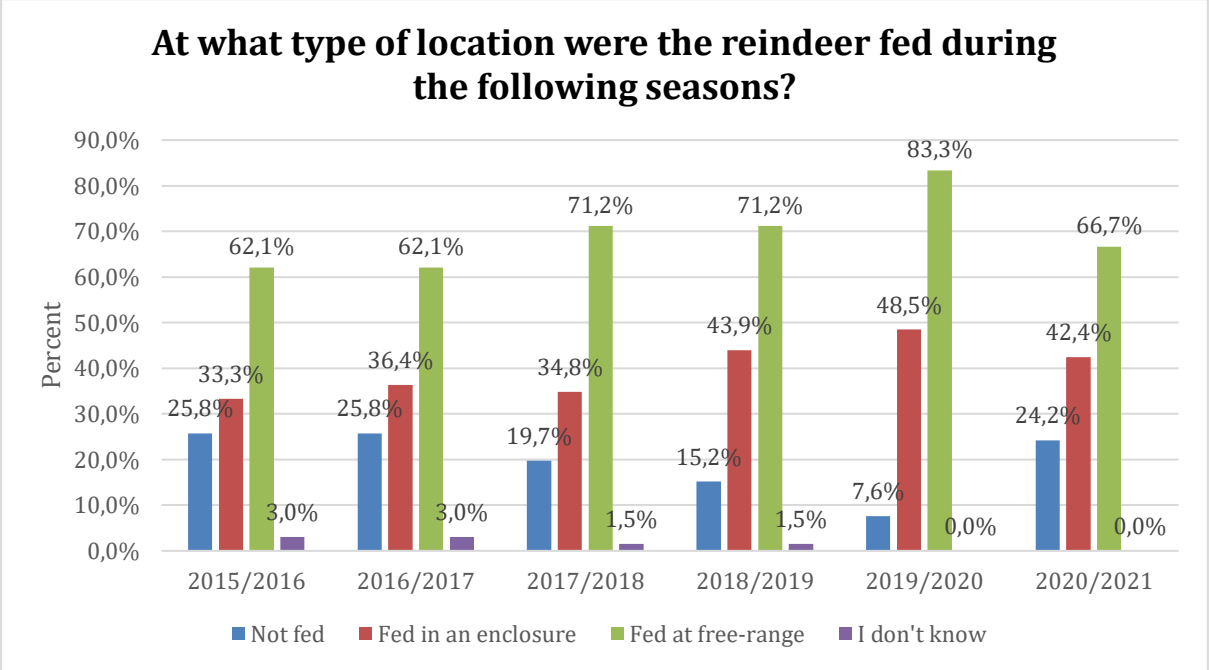

Figure 18 – Answers from semi-domesticated reindeer herders regarding the location in which the reindeer herds were fed in each season between 2015-2021. Each season includes answers from 66 respondents.

Table 7 – Distribution of answers from Norwegian and Swedish semi-domesticated reindeer herders regarding the location in which the reindeer herds were fed during the season 2020/2021.

	Norway	Sweden	Total
Not fed	10	6	16
Fed in enclosure	4	24	28
Fed at free-range	17	27	44

For the 76 respondents, the main reason for providing supplementary feed to the reindeer was poor winter grazing conditions (n=54; 71.0%) followed by survival of reindeer by avoiding starvation (n=46; 60.5%) (Table 8).

Table 8 – Answers from semi-domesticated reindeer herders regarding which reasons were given for providing supplementary feed to their reindeer herds in winter, over the last 5 years. The numbers in the table represent the number om respondents for each alternative, and each respondent could choose multiple answers.

	Live reindeer**	Reindeer for slaughter	Total Answers
Poor winter grazing conditions	54	15	54
Survival	46	8	46
Competing land uses	31	8	31
Predators	28	8	28
Better growth	21	10	25
Disease	20	3	20
Reduce cesium content (Chernobyl accidents) *	1	11	11
Other	9	2	9

**All 11 respondents to this alternative were located in Sweden. 10 were from Västerbotten county, and one from Norrbotten.*
***Live reindeer are animals not intended for slaughter.*

5. Discussion

Despite having the survey open for approximately 21 weeks, and sending regular reminders to the target group, only 76 full responses on the questionnaire were received. If the survey was to be successfully delivered to all of the people associated with reindeer husbandry in Norway and Sweden, there could have potentially been about 7800 responses. Although it is unknown if all of the people associated with reindeer husbandry are herders.

Even though the lack of responses makes it difficult to make assumptions about the general situation in Norway and Sweden, the responses to this questionnaire can be used as indicators to the current situation regarding the presence of health issues in the reindeer herds and the current reindeer feeding situation. Only six herders south of Nordland county in Norway answered the questionnaire, thus making it difficult to compare their answers with the results from the regions in Northern Norway. Therefore, it was decided to only compare Norway to Sweden regarding the questions that were chosen to be part of this thesis.

It is interesting to see the respondent's gender distribution between the countries (Table 1), where approximately half of the respondents from Sweden were female (n=21; 48.8%), compared to only 18.2% female respondents in Norway (n=6). It is unknown if gender has any significance to the results of this study.

If the survey was to be conducted again, some of the questions would need to be formulated differently. All of the questions regarding seasons, should be specified by which months are included in each season. There should also have been more questions regarding single cases of disease in addition to outbreaks. There could have been put more resources into calling each of the Norwegian districts, although it doesn't seem to have made much of a difference in Sweden, where every Sámi village was contacted directly.

There should be a way to get hold of contact information to every herder in the country, instead of only the leaders of the districts and Sámi villages, or a way to cooperate closer with organizations related to reindeer husbandry. Perhaps there should also be a way to share the results in an understandable way, with the reindeer

herders. That way they might feel they have contributed to the science and that their opinions and experiences matter.

5.1 Infectious keratoconjunctivitis (IKC)

As stated in the results, 60.6% [95% CI: 43.9-77.3 %] of the respondents from Norway and 79.1% [95% CI: 66.9-91.2 %] of the respondents from Sweden had seen IKC in the last 10 years. 33.3% of the respondents from Norway and 53.5% of the respondents from Sweden had seen IKC in the past year. Although the proportion of herders reporting seeing IKC in their herds is higher in Sweden, this difference is not significant.

Combining Norway and Sweden, 67.1% had seen IKC in the past 10 years, and 3.9% were unsure, adding up to 71.0% [95% CI: 60.9-81.3 %]. In a similar study conducted back in 2010 (Tryland et al., 2016), 43% had observed IKC in the past year and 38% had seen it in the last 2 years (not including 2010), adding up to 81% [95% CI: 67.5-88.0 %] while 18% had never observed IKC. According to these numbers, it seems that the occurrence of IKC has decreased in the last decade.

Table 3 describes which clinical signs were seen by the herders, referring to Figure 7 A-C. If removing the alternative “never” and combining “sometimes” and “often”, 47 herders had seen alternative A (Lacrimation and discoloration of the fur under the eye), 46 had seen alternative B (corneal oedema) and 19 had seen alternative C (pink eye/conjunctivitis). This indicates that the herders become aware of the disease even in the very early stages with increased tear flow, and when the cornea becomes blue-grey and therefore easier to notice.

Only taking into account observations of IKC in winter (Figure 8), observations of; infected calves was at 54.9% [95% CI: 41.3-68.6 %], infected young animals was at 46.2% [95% CI: 32.6-59.7 %] and infected adults was at 56.6% [95% CI: 43.3-70.0 %]. There was not found any clear difference in IKC cases between any of the groups.

One of the questions that were considered more relevant in this questionnaire, was where the herds were during outbreaks of IKC. The hypothesis behind this question

was that the highest number of outbreaks would be where the corralling and density is highest, i.e., in reindeer kept in enclosures, followed by free-range animals with feeding. Figure 9 shows that in all disease events and in all seasons from 2015 to 2021, the highest abundance of outbreaks was in enclosures, as expected, but closely followed by free-range without feeding, which was unexpected. Free-range with feeding had the lowest number of outbreaks in every season. For the latest season (2020/2021), there were nine IKC outbreaks at free-range without feeding [95% CI: 7.4-28.7 %], four cases at free-range with feeding [95% CI: 0.5-15.5 %] and 10 cases in enclosures [95% CI: 8.9-31.1 %] (Table 4). Although this observation is based on a limited number of respondents only, and thus may not lead to firm conclusions, the data do not support the hypothesis and needs to be explored further.

One possible explanation is that perhaps the animals that are well fed have a stronger immune response to withstand infection under similar conditions (i.e., free-range). This could also mean that the herders are aware of the risk of infection following corralling, and take measures in the methods of feeding, perhaps by spreading the feed over larger areas to avoid animal aggregations and keeping good hygiene at feeding posts.

Furthermore, the herders were asked if they experienced changes in the number of IKC affected animals over the past 5 years (Figure 10; Table 5). Most of them (n=23) experienced neither an increase nor a decrease of incidences. Thirteen did however experience an increase of cases, with 12 of them being located in Sweden, while six experienced a decrease. Herders were then asked to comment what they think is the reason for the changes. The herders that experienced an increase mostly think it has to do with feeding conditions, higher stress, and warmer and wetter weather. The herders that experienced a decrease mostly think it has to do with better fencing, smarter feeding and better biosecurity measures. These herders reported that they are more careful and vigilant around the disease, e.g., they separate infected animals and don’t wear the same clothes around the groups of infected and healthy animals.

When asked what measures were taken when they last saw reindeer suffering from IKC, 55.6% (n=30) chose to slaughter the animals (Figure 11), 37.0% (n=20) chose

to separate the affected animals in a pen, and 9.3% (n=5) did not use any mitigating measures.

5.2 Contagious ecthyma (CE)

Out of the 10 herders that have possibly seen clinical signs of CE in the last 10 years, only two had seen it in the past year (Figure 13), one herder in Sør-Trøndelag county in Norway and one herder in Norrbotten county in Sweden.

In Norway, 6.1% (n=2) [95% CI: 0.0-14.2 %] of the respondents had observed CE in the past 10 years. In Sweden, 14.0% (n=6) [95% CI: 3.6-24.3 %] of the respondents had observed CE. Based on this sample size, it cannot be concluded that there is a difference between the countries.

In the period between 2017 and 2021, the respondents in this survey had only observed outbreaks of CE at free-range without feeding. This may indicate that outside factors were contributing to outbreaks of CE. In the period between 2015 – 2017, outbreaks in enclosures were also observed. There was no question about where potential single cases were observed. Thus, it is unknown if there were higher risks of sporadic infection at any specific locations.

There were more questions presented in the questionnaire about this topic, but as there were so few respondents that had encountered this disease, it was decided to not go deeper into these results in this study. As CE in reindeer has only been reported once in Norway, and a few times in Sweden, the results were not surprisingly low. It is, however, important to explore the appearance of this disease, as there might have been some unreported cases.

5.3 Oral necrobacillosis

Nineteen herders (25.0%) reported seeing oral necrobacillosis in the past 10 years, with six herders having seen it in the past year (Figure 15). All of those that had seen the disease in the last year were from Sweden. Regarding the other 13 herders, 10 were located in Sweden, and only three cases were located in Norway.

Eighteen of the herders that had seen oral necrobacillosis in the past 10 years had provided supplementary feed to their herds in the past 5 years. There was no difference in cases observed at free-range and in enclosures for the season 2020/2021.

In Norway, 9.1% (n=3) [95% CI: 0.0-18.9 %] of the respondents had observed oral necrobacillosis. While 37% (n=16) of the respondents from Sweden [95% CI: 22.8-51.7 %], had observed it in their herds. Although the sample size is small, there is a significant difference between the countries. This implies that the disease is more common in Sweden and the cause of outbreaks should be explored further.

5.4 Other diseases

The respondents were asked which other diseases they had encountered since winter season 2019/2020 (Table 6). The most common problems, with over 50% of the responses were parasites, abortion of fetus and diarrhea. Both Norway and Sweden had close to 60% occurrence of parasites, but Sweden had a higher percentage of abortion of fetus and diarrhea, than Norway (Table 6).

The herders were asked if they treat against warbles and botfly larvae regularly. Most of the herders (n=58; 76.3%) do treat regularly, and almost all of them treat in fall and/or winter. Of the herders that treat for warbles and botfly larvae, 86.2% (n=50) treat a combination of live calves (calves that are not to be slaughtered), bulls and cows. The herders were given the alternative to comment on their answer and the comments seem to indicate that they either treat the entire herd or all animals that are not to be slaughtered. One herder commented that they treat every 2-3 years, and another commented that they treat every 3-4 years. Yet another herder expressed their concerns about only having one product they can use (Ivermectin), and the possibility of the larvae developing resistance against the treatment. This could be the same reason as to why the herders do not treat the animals every year. It would be interesting to find out if the treatment has become less effective for some herders, i.e., if there is experienced higher resistance among the warbles and botfly larvae against Ivermectin.

When asked about ticks, only two herders reported seeing ticks on their reindeer, and these were from Nordland and Sør-Trøndelag counties in Norway. It is not known if the herders that have seen ticks on their reindeer have seen it on multiple occasions or as single events, where the tick could have come with a migrating bird or a mammal. However, these finding are not surprising as permanent tick-populations are reported along the coast in Norway as far north as Dønna in Nordland county (Hvidsten et al., 2020).

5.5 Feeding

Sixty-six of the respondents (86.8%) had provided emergency and/or supplementary feed to their reindeer herds in the past 5 years. The distribution of the herders that have and have not supplementary fed their animals can be observed in Figure 17. As there were only 10 herders that did not supplementary feed their reindeer, we checked where they were located. They seem to be relatively evenly spread throughout both countries. Interestingly all three of the respondents from Hedmark county in Norway, said they provided no supplementary feed to their herds. This also applies for the one respondent from Nord-Trøndelag County, Norway. In comparison, all of the respondents from Troms (n=5), Øst-Finnmark (n=7) and Sør-Trøndelag (n=2) counties, Norway, provided supplementary feed to their animals. The reason for this could be that the grazing conditions are better in the south of the country, which can be supported by the reported dressed weight of reindeer in each county (Landbruksdirektoratet), where the highest carcass weight is in the south, and the lowest is in the north. The herd in Nord-Trøndelag consisted of only 250-499 reindeer (Figure 6), which could be a reason for not needing to feed the herd, but all the herds in Hedmark were at 2000-2999 animals. If the herds in Hedmark were not connected to the Sámi districts, but were in fact tamreinlag, it is possible that they were not as financially dependent of the survival of the herd and therefore not willing to invest as much in the herd. However, the low number of respondents in these areas do not allow for a more proper analysis into this matter.

In Sweden one herder in Norrbotten, one herder in Västerbotten and two herders in Dalarna/Jämtland did not provide supplementary feed. There is not really a clear

regional border that separates the herders that choose to supplementary feed their animals from the ones that don't.

Figure 18 shows that most of the herds were fed at free-range, every season since 2015. This is interesting, as it can be seen in Figure 9, that among the animals that were fed, there have been more outbreaks of IKC in enclosures, closely followed by free-range without feeding. In 2020/2021, 66.7% (n=44) were fed at free-range [95% CI: 55.3-78.0 %], 24.2% (n=16] were not fed [95% CI: 13.9-34.6 %] and 42.4% (n=28) were fed in enclosures [95% CI: 30.5-54.4 %]. The number of herds that were fed at free-range was significantly higher than the herds that were fed in enclosures and the herds that were not fed at all.

It could also be noted that there is a slight increase in herds that were being fed, from the season of 2015/2016 up until the season of 2019/2020 (Figure 18). However, the last season of 2020/2021 had a higher number of herds that were not being fed. The winter season of 2019/2020 was considered a winter with extreme amounts of snow, making it difficult for the reindeer to dig for food in the terrain (Rørstad et al., 2020). This could, by itself, explain the reduction in the number of herds that were not fed in 2019/2020.

In Norway and Sweden, 30.3% (n=10) [95% CI: 14.6-46.0 %] and 14.0% (n=6) [95% CI: 3.6-24.3 %] of the respondents respectively did not feed their herds in the winter season 2020/2021 (Table 7).

During the same time period, 12.1% of the Norwegian respondents (n=4) [95% CI: 0.9-23.3 %] and 55.8% of the Swedish respondents (n=24) [95% CI: 41.0-70.7 %], fed their herds in enclosures (Table 7), and 51.5% of the Norwegian respondents (n=17) [95% CI: 34.5-68-6 %] and 62.8% of the Swedish respondents (n=27) [95% CI: 48.3-77.2 %], fed their herds at free range (Table 7).

According to these calculations, Sweden had a significantly higher number of herds fed in enclosures than Norway. There was, however, not found a conclusive difference in feeding routines at free-range between the countries.

The main reason given by herders for the supplementary feeding of herds, was poor winter grazing conditions, followed by a need to help the survival of the animals (Table 8).

6. Conclusions

The number of respondents were too limited for statistical calculations. Nevertheless, the results from the study increases our knowledge about occurrences of diseases and feeding practices within the reindeer husbandry in Norway and Sweden. The findings may be used to identify which factors are worth exploring further with in depth interviews, and to design focused regional studies or future surveys on the subject.

IKC seems to be a common disease in reindeer with 67.1% of the respondent having observed in the last 10 years. There was no clear difference of cases with IKC between Norway (60.6%) and Sweden (79.1%), reported in this year's survey, and a majority of the respondents reported observing clinical signs in the early stages of IKC (lacrimation and discoloration of the fur under the eye, or corneal oedema). There was also no clear difference of reported IKC between the age groups (calves, young animals and adults).

Further exploration is needed to address if more animals are affected by IKC when in enclosures, as compared to free-ranging animals, and if feeding is a triggering factor for outbreaks.

CE on the other hand could not be concluded to be a common disease in reindeer, with 10 respondents having possibly observed clinical signs in their reindeer in the last 10 years. In the period between 2017 and 2021, the respondents had only observed outbreaks of CE at free-range without feeding.

As for CE, oral necrobacillosis could not be concluded to be a common disease in reindeer, with 19 respondents having observed clinical signs in the last 10 years. Unlike CE, the majority of the herders that observed cases of oral necrobacillosis had provided their herds with supplementary feed in the past 5 years. There was also shown to be a significantly higher number of cases in Sweden.

Apart from the diseases mentioned above, the respondents reported parasites, abortion of fetuses and diarrhea to be the most common problems in their herds. Warbles and botfly larvae were big enough problem for 76.3% of the herders to regularly treat the animals with Ivermectin in winter and/or fall.

Ticks did not seem to be a problem for many reindeer herders in Norway and Sweden. Those that did experience ticks on their animals, presumably considered them to be a problem. Ticks are expected expand their geographical distribution in Norway and Sweden, as climate change progresses.

When it comes to feeding, 86.8% of the respondents provided supplementary feed to their herds during the past 5 years. There was reported a significantly higher number of herds fed at free-range than fed in enclosures. The majority of herds kept at free-range were fed. There was also significantly higher number of Swedish herders that provided feed in enclosures than Norwegian herders.

The reported main reason for providing supplementary feed to the reindeer herds was poor winter grazing conditions, which are likely to be the result of climatic and anthropogenic factors.

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Appendix

Supplementary figures

Additional figures describing the results found in this thesis.

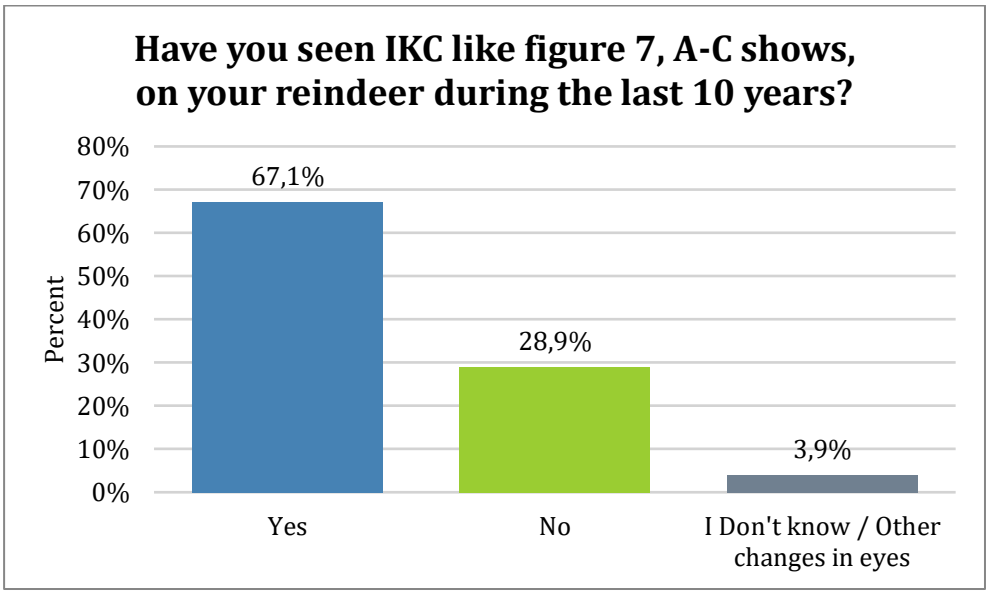

Figure 19 – Answers from semi-domesticated reindeer herders regarding observations of infectious keratoconjunctivitis (IKC) during the last 10 years.

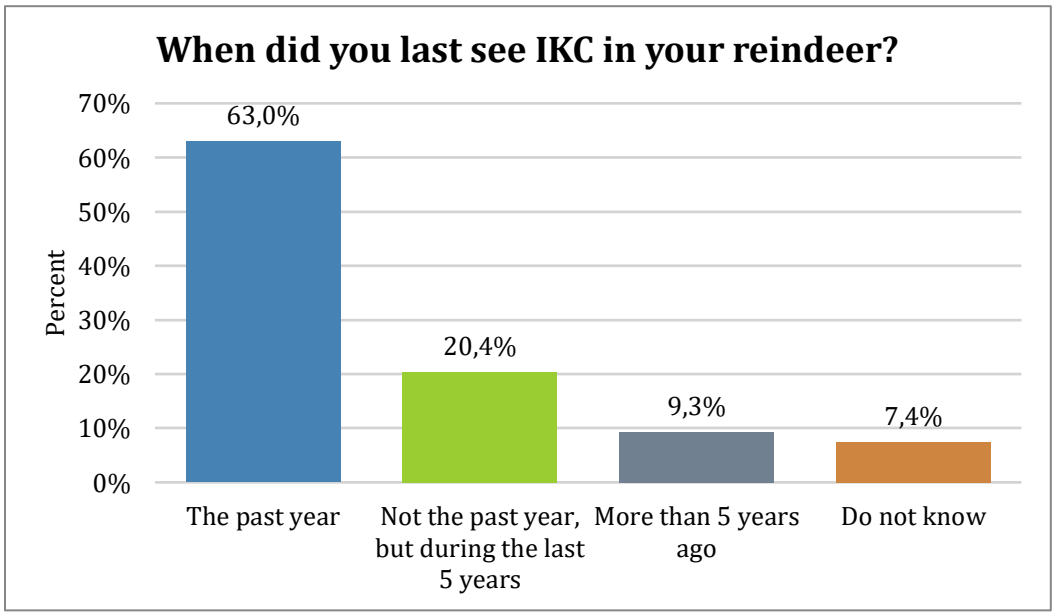

Figure 20 – Answers from 54 semi-domesticated reindeer herders regarding the last time they had observed infectious keratoconjunctivitis (IKC).

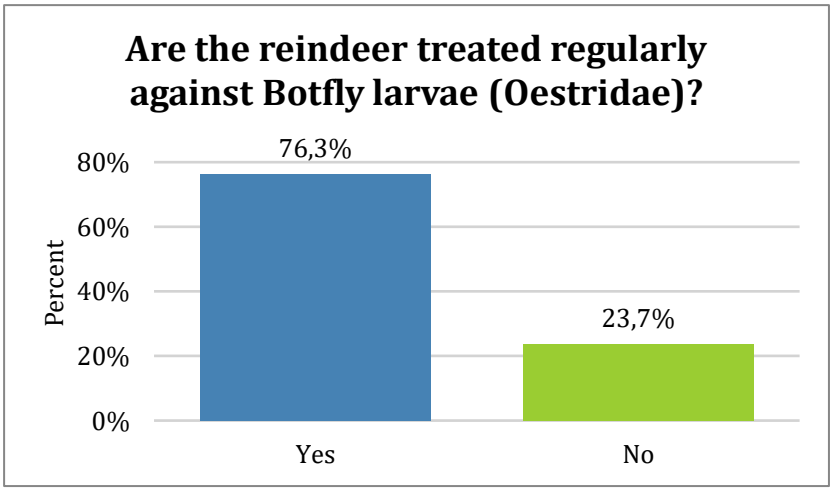

Figure 21 – Answers from semi-domesticated reindeer herders regarding regular treatment for warbles and botfly larvae

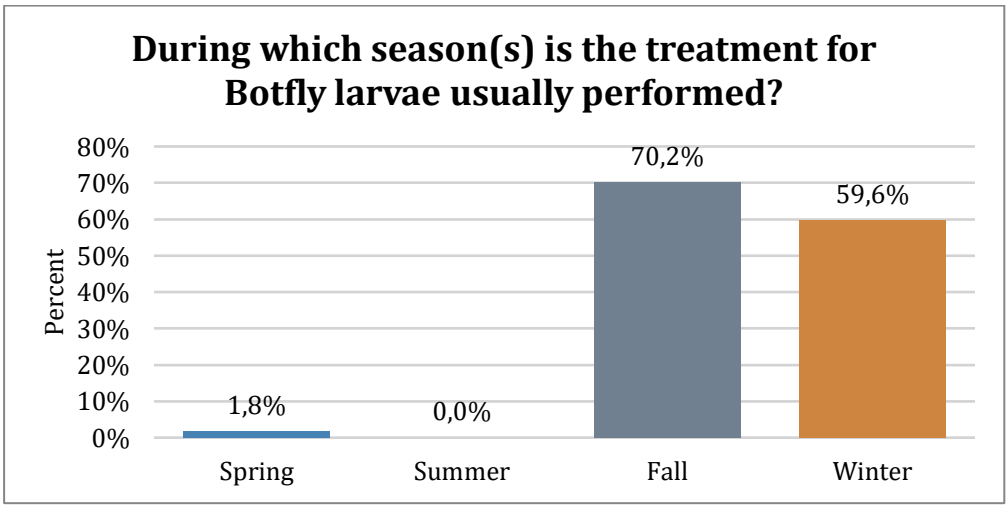

Figure 22 – Answers from 57 semi-domesticated reindeer herders regarding which season treatment was given for warbles and botfly larvae.

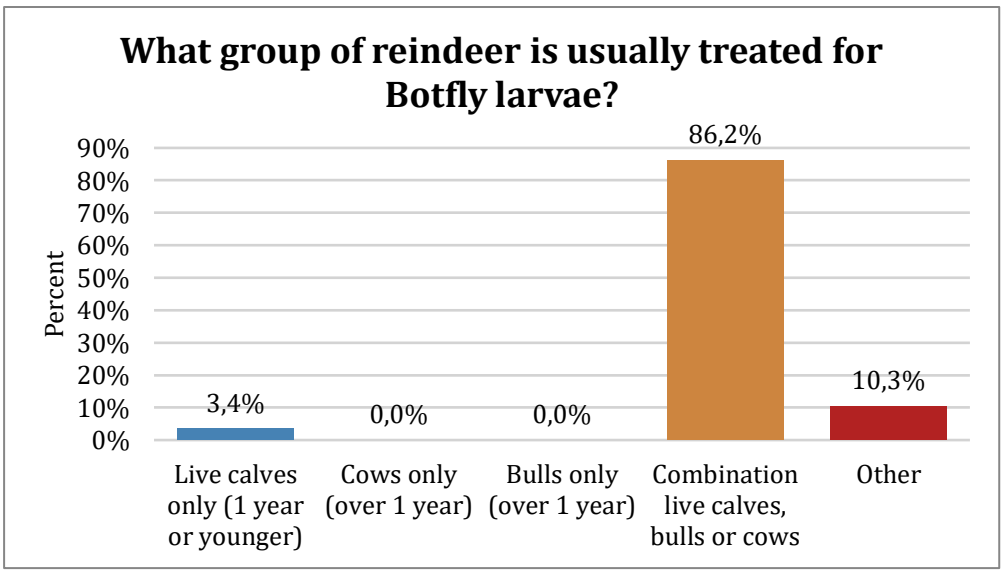

Figure 23 – Answers from 58 semi-domesticated reindeer herders regarding which group of animals was given the treatment for warbles and botfly larvae. Live calves are calves that are not to be taken to slaughter.

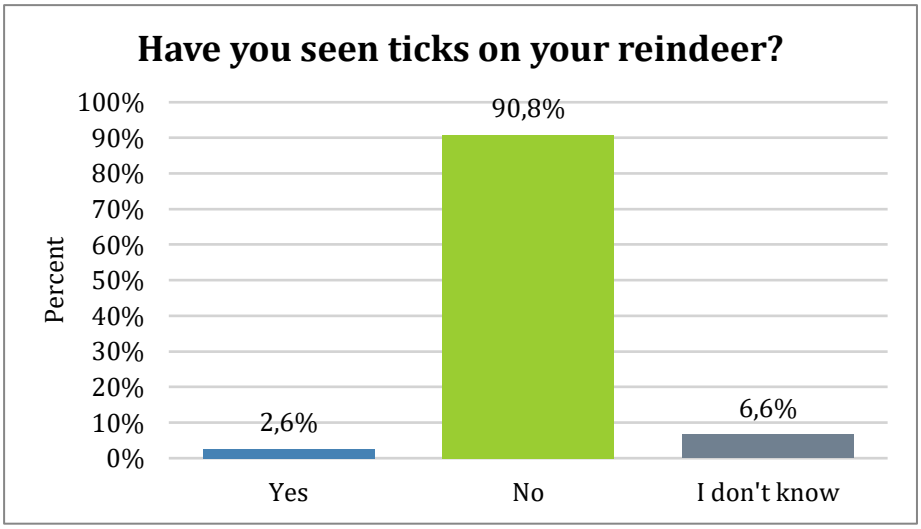

Figure 24 – Answers from semi-domesticated reindeer herders regarding observations of ticks on their reindeer.

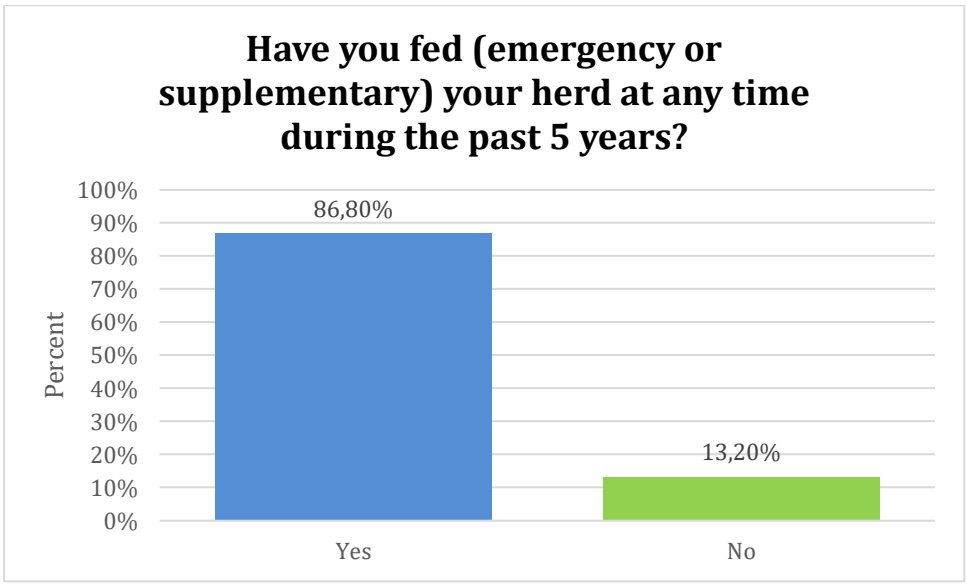

Figure 25 – Answers from semi-domesticated reindeer herders regarding them providing their herds with supplementary feed at any time during the last 5 years.

Questionnaire

The Norwegian version of the questionnaire:

Norwegian (Bokmål)
I hvilket land driver du hovedsakelig med reindrift?
Med mindre annet er oppgitt, henviser spørsmålene i undersøkelsen til vinterværforhold i løpet av 2019-2020. Spørsmålene gjelder personen som svarer på undersøkelsen.

- Norge
- Sverige

I hvilken region driver du hovedsakelig med reindrift?

- Dalarna/Jämtland
- Västerbotten
- Norrbotten

Angi i hvilken type sameby du driver med reindrift?

- Fjällsameby
- Skogssameby
- Koncessionssameby

I hvilken region driver du hovedsakelig med reindrift?

- Øst Finnmark
- Vest Finnmark
- Troms
- Nordland
- Nord-Trøndelag
- Sør-Trøndelag
- Møre- og Romsdal
- Hedmark

Hvor lang erfaring har du med å arbeide med reindrift?

- Under 5 år
- 5-9 år
- 10-29 år
- Over 30 år

Oppgi kjønn?

- Kvinne
- Mann
- Vil ikke svare

Oppgi din alder?

- Yngre enn 20
- 20-39
- 40-59
- Over 60

Hva er det omtrentlige antallet dyr i din reinflokk (vinterflokk) etter årlig slakting?

- Under 50
- 50-99
- 100-249
- 250-499

- 500-999
- 1000-1999
- 2000-2999
- Over 3000

Her følger spørsmål om tre infeksjonssykdommer som kan være relatert til fôring.
1. Smittsom øyebetennelse/øyeforandring: Smittsom øyebetennelse/øyeforandring kan starte med tåreflod som gir fuktighet i pelsen under øynene. Sykdommen kan være forårsaket av både virus og bakterier og er derfor smittsom og kan gi opphav til ulike øyeforandringer, som f.eks. vist på Bilde 1 A-C.
Har du sett lignende øyeforandringer som bilde 1. A-C viser, på dine reinsdyr de siste 10 årene?

- Ja
- Nei
- Vet ikke / annen øyeforandring, beskriv under

Beskriv hvilken annen øyeforandring du har sett:
Når så du sist lignende forandringer som vist på bilde 1. A-C? Om du har oppgitt en annen øyeforandring / symptom, svarer du på følgende spørsmål om øyebetennelse / øyeforandring basert på det.

- Det siste året
- Ikke det siste året, men de siste 5 årene
- Mer enn 5 år siden
- Vet ikke

Hvilken av bildene A-C ser du som oftest på berørte reinsdyr?

- A
- B
- C
- Annet symptom, oppgis i kommentarfeltet nedenfor
- Aldri
- Noen ganger
- Ofte

Plass for kommentarer:
Når på året ser du flest antall reinsdyr med smittsom øyebetennelse/øyeforandring? Oppgi for kalv, ungdyr og voksne dyr. Det er mulig å velge flere sesonger.

- Kalv (yngre enn 1 år)
- Unge dyr (1-3 år)
- Voksne djur (eldre enn 3 år)
- Ikke observert
- Vår
- Sommer
- Høst
- Vinter
- Året rundt (oppgi som det eneste alternativet!)

Plass for kommentarer:
Oppgi, for hver av sesongene nedenfor, hvor reinen befant seg under utbrudd av smittsom øyebetennelse / øyeforandring. Alternativt at ingen utbrudd fant sted. Utbrudd defineres som en betydelig økning i antall tilfeller over en viss tidsperiode, for eksempel flere berørte dyr enn vanlig i løpet av en sesong, eller over en kortere tidsperiode, for eksempel noen få uker.

- 2015/2016
- 2016/2017
- 2017/2018
- 2018/2019
- 2019/2020
- 2020/2021
- Ikke opplevd utbrudd
- Utbrudd i innhegningen
- Utbrudd på fribeite med fôring
- Utbrudd på fribeite uten fôring

Plass for kommentarer:
Omtrent hvor mange reinsdyr ble berørt i gruppen der det sist var utbrudd, alternativt tilfeller av smittsom øyebetennelse / øyeforandring? Oppgi i første omgang antallet ved utbrudd om du har opplevd det.

- Antall kalv (yngre enn 1 år)
- Antall unge dyr (1-3 år)
- Antall voksne (eldre enn 3 år)
- Totalt antall reinsdyr i den berørte gruppen på tidspunktet for utbruddet (både friske og syke)

Plass for kommentarer:
Opplever du at antallet reinsdyr som berøres av smittsom øyebetennelse / øyeforandring har endret seg de siste 5 årene?

- Ja, forekomsten har økt
- Ja, avtagende forekomst
- Nei, sykdomsfrekvensen er uendret
- Vet ikke

Hva tror du denne økningen kan skyldes?
Hva tror du denne avtagende forekomst kan skyldes?
Gjøres det vanligvis tiltak (f.eks. gruppering, slakting eller annen håndtering) når du ser reinsdyr berørt av smittsom øyebetennelse / øyeforandring?

- Ja
- Nei
- Vet ikke

Hvilke tiltak ble iverksatt da du sist så reinsdyr berørt av smittsom øyebetennelse / øyeforandring? Oppgi alle tiltak som ble satt i verk.

- Ingen tiltak
- Gruppering av berørte dyr i eget gjerde for syke dyr
- Veterinær ble kontaktet
- Antibiotika som gis med sprøyte i muskel
- Antibiotika i øyet
- Slakt
- Avliving/kassering
- Behandling med andre legemidler, oppgi i kommentarfeltet under
- Annet, forklar i kommentarfeltet under

Plass for kommentarer:
Har utbrudd eller tilfeller av smittsom øyebetennelse / øyeforandring ført til økonomiske konsekvenser?

- Ja
- Nei
- Vet ikke

Plass for kommentarer:

Har noen av forandringene på bildene et tradisjonelt navn for deg eller for Siida enheten?

- Ja, oppgi i kommentarfeltet under
- Nei
- Vet ikke

Plass for kommentarer/oppgi tradisjonelt navn:

- A:
- B:
- C:

Annen øyeforandring:

Kjenner du til noen tradisjonelle behandlinger av smittsom øyebetennelse / øyeforandring?

- Ja, beskriv i kommentarfeltet under
- Nei
- Vet ikke

Plass for kommentarer:

Legg gjerne igjen andre kommentarer relatert til smittsom øyebetennelse / øyeforandring her:

2. Her følger spørsmål om smittsom munnskurv (orf): Bilde 2. A-B

Har du sett lignende forandringer som bilde 2. A-B viser, på dine reinsdyr de siste 10 årene?

- Ja
- Nei
- Vet ikke

Når så du sist lignende forandringer som vist på bilde 2. A-B?

- Siste året
- Ikke det siste året, men for mindre enn 5 år siden
- Mer enn 5 år siden
- Vet ikke

Når på året ser du flest antall reinsdyr med smittsom munnskurv (orf)? Oppgi for kalv, unge dyr og voksne dyr. Det er mulig å velge flere sesonger.

- Kalv (yngre enn 1 år)
- Unge dyr (1-3 år)
- Voksen (over 3 år)
- Ikke observert
- Vår
- Sommer
- Høst
- Vinter
- Året rundt (oppgi som eneste svarsalternativ!)

Plass for kommentarer:

Oppgi, for hver av sesongene nedenfor, hvor reinen befant seg under utbrudd av smittsom munnskurv (orf). Alternativt at ingen utbrudd fant sted. Utbrudd defineres som en betydelig økning i antall tilfeller over en viss tidsperiode, for eksempel flere berørte dyr enn vanlig i løpet av en sesong, eller over en kortere tidsperiode, for eksempel noen få uker.

- 2015/2016

- 2016/2017
- 2017/2018
- 2018/2019
- 2019/2020
- 2020/2021
- Ikke opplevd utbrudd
- Utbrudd i innhegningen
- Utbrudd på fribeite med fôring
- Utbrudd på fribeite uten fôring

Plass for kommentarer:

Omtrent hvor mange reinsdyr ble berørt i gruppen der det sist var utbrudd, alternativt tilfeller av smittsom munnskurv (orf)? Oppgi i første omgang antallet ved utbrudd om du har opplevd det.

- Antall kalv (yngre enn 1 år)
- Antall unge dyr (1-3 år)
- Antall voksne (eldre enn 3 år)
- Totalt antall reinsdyr i den berørte gruppen på tidspunktet for utbruddet (både friske og syke)

Plass for kommentarer:

Opplever du at antallet reinsdyr som berøres av smittsom munnskurv (orf) har endret seg de siste 5 årene?

- Ja, forekomsten har økt
- Ja, avtagende forekomst
- Nei, sykdomsfrekvensen er uendret
- Vet ikke

Hva tror du denne økningen i antall berørte reinsdyr kan skyldes?

Hva tror du denne avtagende forekomst kan skyldes?

Gjøres det vanligvis tiltak (f.eks. gruppering, slakting eller annen håndtering) når du ser reinsdyr berørt av smittsom munnskurv (orf)?

- Ja
- Nei
- Vet ikke

Hvilke tiltak ble iverksatt da du sist så reinsdyr berørt av smittsom munnskurv (orf)? Oppgi alle tiltak som ble satt i verk.

- Ingen tiltak
- Gruppering av berørte dyr i eget gjerde for syke dyr
- Veterinær ble kontaktet
- Antibiotikabehandling
- Slakt
- Avliving/kassering
- Behandling med andre legemidler, oppgi i kommentarfeltet under
- Annet, forklar i kommentarfeltet under

Plass for kommentarer:

Har utbrudd eller tilfeller av smittsom munnskurv (orf) ført til økonomiske konsekvenser?

- Ja
- Nei
- Vet ikke

Plass for kommentarer:

Har noen av forandringene på bildene et tradisjonelt navn for deg eller for Siida enheten?

- Ja, oppgi i kommentarfeltet under
- Nei
- Vet ikke

Plass for kommentarer/oppgi tradisjonelt navn:
Kjenner du til noen tradisjonelle behandlinger av smittsom munnskurv (orf)?

- Ja, beskriv i kommentarfeltet under
- Nei
- Vet ikke

Plass for kommentarer:
Legg gjerne igjen andre kommentarer relatert til smittsom munnskurv (orf) her:
3. Spørsmål om munnråte/oral nekrobacillose/njunnevikke: Bilde 3. A-C
Har du sett lignende forandringer som bilde 3. A-C viser, på dine reinsdyr de siste 10 årene?

- Ja
- Nei
- Vet ikke

Når så du sist lignende forandringer som vist på bilde 3. A-C?

- Siste året
- Ikke det siste året, men for mindre enn 5 år siden
- Mer enn 5 år siden
- Vet ikke

Når på året ser du flest antall reinsdyr med munnråte/oral nekrobacillose/njunnevikke? Oppgi for kalv, unge dyr og voksne dyr. Det er mulig å velge flere sesonger.

- Kalv (yngre enn 1 år)
- Unge dyr (1-3 år)
- Voksen (over 3 år)
- Ikke observert
- Vår
- Sommer
- Høst
- Vinter
- Året rundt (oppgi som eneste svarsalternativ!)

Plass for kommentarer:
Oppgi, for hver av sesongene nedenfor, hvor reinen befant seg under utbrudd av munnråte/oral nekrobacillose/njunnevikke. Alternativt at ingen utbrudd fant sted. Utbrudd defineres som en betydelig økning i antall tilfeller over en viss tidsperiode, for eksempel flere berørte dyr enn vanlig i løpet av en sesong, eller over en kortere tidsperiode, for eksempel noen få uker.

- 2015/2016
- 2016/2017
- 2017/2018
- 2018/2019
- 2019/2020
- 2020/2021
- Ikke opplevd utbrudd
- Utbrudd i innhegningen
- Utbrudd på fribeite med fôring

- Utbrudd på fribeite uten fôring

Plass for kommentarer:

Omtrent hvor mange reinsdyr ble berørt i gruppen der det sist var utbrudd, alternativt tilfeller av munnråte/oral nekrobacillose/njunnevikke? Oppgi i første omgang antallet ved utbrudd om du har opplevd det.

- Antall kalv (yngre enn 1 år)
- Antall unge dyr (1-3 år)
- Antall voksne (eldre enn 3 år)
- Totalt antall reinsdyr i den berørte gruppen på tidspunktet for utbruddet (både friske og syke)

Plass for kommentarer:

Opplever du at antallet reinsdyr som berøres av munnråte/oral nekrobacillose/njunnevikke har endret seg de siste 5 årene?

- Ja, forekomsten har økt
- Ja, avtagende forekomst
- Nei, sykdomsfrekvensen er uendret
- Vet ikke

Hva tror du denne økningen i antall berørte reinsdyr kan skyldes?

Hva tror du denne avtagende forekomst kan skyldes?

Gjøres det vanligvis tiltak (f.eks. gruppering, slakting eller annen håndtering) når du ser reinsdyr berørt av munnråte/oral nekrobacillose/njunnevikke?

- Ja
- Nei
- Vet ikke

Hvilke tiltak ble iverksatt da du sist så reinsdyr berørt av munnråte/oral nekrobacillose/njunnevikke? Oppgi alle tiltak som ble satt i verk.

- Ingen tiltak
- Gruppering av berørte dyr i eget gjerde for syke dyr
- Veterinær ble kontaktet
- Antibiotikabehandling
- Slakt
- Avliving/kassering
- Behandling med andre legemidler, oppgi i kommentarfeltet under
- Annet, forklar i kommentarfeltet under

Plass for kommentarer:

Har utbrudd eller tilfeller av munnråte/oral nekrobacillose/njunnevikke ført til økonomiske konsekvenser?

- Ja
- Nei
- Vet ikke

Plass for kommentarer:

Har noen av forandringene, som vist på bildene over, et tradisjonelt navn for deg eller for Siida enheten?

- Ja, oppgi i kommentarfeltet under
- Nei
- Vet ikke

Plass for kommentarer/oppgi tradisjonelt navn:

Kjenner du til noen tradisjonelle behandlinger av munnråte/oral nekrobacillose/njunnevikke?

- Ja, beskriv i kommentarfeltet under
- Nei
- Vet ikke

Plass for kommentarer:
Har du sett lignende forandringer, som vist på bildene over, i magen på dine reinsdyr (ved slakt / obduksjon)?

- Ja
- Nei
- Vet ikke

Legg gjerne igjen andre kommentarer relatert til munnråte/oral nekrobacillose/njunnevikke her:
Hvilke sykdommer har du observert fra vintersesongen 2019/2020 frem til idag? Oppgi alle alternativ som stemmer.

- Kasting av foster
- Livmorprolaps (livmorframfall - at livmor vrenges ut av dyret)
- Ustøhet/halthet
- Avmagring
- Bløt buk
- Diaré
- Skvalpmage (løst, vandig innhold i mageavsnitt)
- Trommesjuke (oppblåst buk)
- Hjernemark
- Parasitter (hudbrems, svelgbrems, innvollsparasitter, hud/pels-parasitter)
- Selvdøde dyr uten kjent dødsårsak
- Annet, oppgi i kommentarfeltet under
- Ingen av sykdommene over

Plass for kommentarer:
Hva ble berørte dyr fôret med før sykdommen 'bløt buk' brøt ut?

- Kun pellets
- Kun silofôr/surfôr
- Kombinasjon pellets og silofôr/surfôr
- Ikke fôret
- Annet: oppgi i kommentarfeltet under

Plass for kommentarer:
Har du observert noen andre/flere symptomer på reinsdyr som er berørt av bløt buk? Beskriv.
Får du den hjelpen du har behov av fra veterinær?

- Ja
- Nei, oppgi årsaken i fritekst:

Plass for kommentarer:
Har du sendt noen reinsdyr til obduksjon?

- Ja
- Nei

Har du selv obdusert noen reinsdyr med veterinærhjelp?

- Ja
- Nei

Plass for kommentarer:

Behandles reinsdyrene regelmessig mot hud- og/eller svelgbrems?

- Ja
- Nei

Under hvilken/hvilke sesonger utføres vanligvis behandlingen mot hud- og/eller svelgbrems?

- Vår
- Sommer
- Høst
- Vinter

Hvilken gruppe av dyr behandles vanligvis mot hud- og/eller svelgbrems?

- Kun livkalver (1 år eller yngre)
- Kun simler (over 1 år)
- Kun bukker (over 1 år)
- Kombinasjon, livkalver, bukker eller simler
- Annet, oppgi i kommentarfeltet under.

Plass for kommentarer:

Flått kan spre smittsomme sykdommer og på grunn av mildere klima, sprer flåtten seg nordover. Har du sett flått på reinsdyrene dine (se bilde 4. A-B)?

- Ja
- Nei
- Vet ikke

Legg gjerne igjen andre kommentarer relatert til andre sykdommer hos rein her:

5. Nå har du bare spørsmål om fôring igjen før undersøkelsen er fullført! Spørsmål om fôring er delt inn i følgende:

1. Generell del
2. Effekter av fôring
3. Fôringsrutiner (gjelder 2019/2020)
4. Annet (gjelder de siste fem årene)

Har du fôret (nød- eller tilleggsfôret) reinsdyrene dine i din vintergruppe ved noen tilfeller de siste 5 årene? Hvis Siida enheten ikke er delt inn i flere vintergrupper, svarer du for hele Siida enheten. Obs: dette refererer til fôring av vintergruppe i innhegning og / eller på fribeite i over to uker, men ikke under flytting og samling som varer under en kortere periode enn to uker.

- Ja
- Nei

1. Generell del.

Dette refererer til fôring (nød- eller tilleggsfôring) av reinsdyrene dine (slakterein og livrein) i vintergruppen i over to uker, i innhegning eller på fribeite, men ikke under flytting og samling som varer en kortere periode enn to uker. Om vintergruppen ikke er delt, svarer du for hele Siida enheten. Oppgi under hver av følgende sesonger, hvor reinsdyrene ble fôret, alternativt at de ikke ble fôret i det hele tatt. Svar for hver sesong, ett / flere alternativ.

- 2015/2016
- 2016/2017
- 2017/2018
- 2018/2019
- 2019/2020
- 2020/2021
- Ikke fôret

- Fôret i innhegningen
- Fôret på fribeite
- Vet ikke

Plass for kommentarer:

Hvorfor ble reinsdyrene vinterfôret de siste fem årene? Oppgi alle alternativ som stemmer for livrein og for slaktrein. Kommenter eventuelle forskjeller mellom årene i kommentarfeltet nedenfor.

- Dårlige vinterbeiteforhold
- Overlevelse
- Bedre vekst
- Rovdyr
- Sykdom
- Redusere cesiuminnhold (Tsjernobylulykken)
- Konkurrerende arealbruk. Spesifiser, hvis mulig i kommentarfeltet under
- Annet, oppgi i kommentarfeltet under
- Livrein
- Slakterein

Plass for kommentarer, oppgi om det gjelder for slakterein eller livrein:

2. Effekter av fôring

Opplever du en forandring i oppførselen til reinsdyr som fôres under en sammenhengende periode på minst to uker når de slippes igjen på fribeite? (for eksempel grad av tamhet, lettere eller vanskeligere å samle, obs: refererer ikke til atferdsendring under fôring).

- Blant reinsdyr fôret i innhegning
- Blant reinsdyr fôret på fribeite
- Ja
- Nei
- Vet ikke

Plass for kommentarer:

Opplever du at kalver som fôres under vinteren har høyere slaktevekt påfølgende høst sammenlignet med kalver som ikke fôres?

- Ja
- Nei
- Vet ikke

Opplever du at kalvefrekvensen (andel simler med kalv) under kalvemerking og/eller om høsten blir positivt påvirket av fôringen av simler vinteren før?

- Ja
- Nei
- Vet ikke

Plass for kommentarer:

Opplever du at fôring påvirker kalvenes evne til å søke og finne beite etterfølgende vinter?

- Ja
- Nei
- Vet ikke

Plass for kommentarer:

3. Spørsmål relatert til fôringsrutiner vinter- og/eller vårsesongen i din vintergruppe, 2019/2020. Dette refererer til fôring (nød- eller tilleggsfôring) av reinsdyrene dine (slakterein og livrein) i vintergruppen i

over to uker, i innhegning eller på fribeite, men ikke under flytting og samling som varer en kortere periode enn to uker. Om vintergruppen ikke er delt, svarer du for hele Siida enheten. Spørsmålene er ment for å kartlegge rutiner ved fôring i dagens situasjon.
Følgende spørsmål gjelder sesongen 2019/2020. Omtrent hvor mange reinsdyr ble fôret totalt i din vintergruppe?

- Under 100
- 100-299
- 300-499
- 500-999
- Over 1000
- I innhegning
- På fribeite

Hvilken/hvilke grupper av dyr ble hovedsakelig fôret av følgende tre kategorier, og hvor befant reinen seg da? Velg ett/flere alternativ.

- Hele vintergruppen
- I hovedsak kalver (1 år eller yngre)
- I hovedsak voksne dyr (over 1 år)
- I innhegning
- På fribeite

Plass for kommentarer:
Omtrent hvor lenge fôret du reinsdyrene dine sammenhengende (oppgi fra den første reinen som ble fôret)? Henviser til nød- eller tilleggsfôring over en to ukers periode i løpet av 2019/2020.

- I innhegning
- På fribeite
- Mindre enn 1 måned
- 1-3 måneder
- Over 3 måneder

Plass for kommentarer:
For å kartlegge rutiner og forhold innen reindrift, følger spørsmål om forskjellige fôr. Hvilke av følgende fôr, fôret du reinsdyrene dine med i innhegning 2019/2020?

- Kun grovfôr (silofôr/surfôr/hösilage/høy)
- Kun pellets
- Kombination av grovfoder och pellets

Hvilke av følgende fôr, fôret du reinsdyrene dine med på fribeite 2019/2020?

- Kun grovfôr (silofôr/surfôr/hösilage/høy)
- Kun pellets
- Kombination av grovfoder och pellets

Plass for kommentarer:
Når fôret du med rein- og/eller hengelav utover det som fantes tilgjengelig i naturen 2019/2020? Oppgi ett / flere valg.

- Som tilskudd til fôring
- Til syke/svake reinsdyr
- Ved tilvenning av fôr
- Har ikke forutsetning / tilgang til lav
- Annet, oppgi i kommentarfeltet under
- I innhegning

- På fribeite

Om mulig, estimer antall grovfôr- / silofôrballer og oppgi typen (f.eks. rund-, eller finkantball) som ble brukt under fôringsperioden 2019/2020?

- I innhegning
- På fribeite

Plass for kommentarer:

Oppgi antall fôringsøkter per dag med pellets (2019/2020).

- I innhegning
- På fribeite
- 1
- 2 eller flere

Om mulig, estimer antall kilo pellets per dyr og dag i gjennomsnitt for sesongen 2019/2020 og oppgi om det gjelder for nød- og / eller tilleggsfôring..

- I innhegning
- På fribeite
- Nødfôring
- Tilleggsfôring

Plass for kommentarer:

Om mulig, oppgi fôrleverandør av pellets under 2019/2020.

- I innhegning
- På fribeite

Hvordan utførtes fôring med pellets vanligvis under forrige sesong (2019/2020)? Kryss av i ett/flere alternativ.

- Direkte på bakken
- Fôringshekk på ben
- Fôringshekk uten ben

Annet, oppgi i kommentarfeltet under.

- I innhegning
- På fribeite

Plass for kommentarer:

4. Spørsmål relatert til andre fôrtyper og fôringsrutiner under de siste fem årene. Dette refererer fortsatt til fôring (nød- eller tilleggsfôring) av reinsdyrene dine (slakterein og livrein) i vintergruppen i over to uker, i innhegning eller på fribeite, men ikke under flytting og samling som varer en kortere periode enn to uker. Om vintergruppen ikke er delt, svarer du for hele Siida enheten. Spørsmålene er ment for å kartlegge rutiner ved fôring i dagens situasjon.

Hvor vanlig er det at reinen gis tilgang til mineraltilskudd (f.eks. mineralsaltstein, mineralbalje, fôrgjær, injeksjon) under fôring de siste fem årene? Velg ett / flere alternativ.

- Alltid under fôring (angi som eneste svarsalternativ)
- Periodevis under fôring
- Enkelte sesonger
- Aldri (angi som eneste svarsalternativ)
- Under spesielle omstendigheter (f.eks. til reinsdyr i dårlig tilstand og i syke innhegning)
- Annet, oppgi i kommentarfeltet under.
- I innhegning
- På fribeite

Plass for kommentarer:
Hvis du benyttet mineraler, oppgi merket og typen du sist benyttet.

- I innhegning
- På fribeite

Hvor vanlig er det at reinsdyrene får tilgang til saltstein ved fôring (tenk på de siste fem årene)? Velg ett/flere alternativ.

- Alltid under fôring (angi som eneste svarsalternativ)
- Periodevis under fôring
- Enkelte sesonger
- Aldri (angi som eneste svarsalternativ)
- Under spesielle omstendigheter (f.eks. til reinsdyr i dårlig tilstand og i syke innhegning)
- Annet, oppgi i kommentarfeltet under.
- I innhegning
- På fribeite

Oppgi andre fôrmidler som anvendtes de siste fem årene (for eksempel fôrgjær).

- I innhegning
- På fribeite

Plass for kommentarer:
Oppgi vanntilgang ved fôring i innhegning de siste fem årene. Velg ett / flere alternativ.

- Fri tilgang til snø
- Snø i balje
- Vann i balje
- Bekk
- Kald kilde
- Annet, oppgi i kommentarfeltet under.

Plass for kommentarer:
Finnes det rutiner for tilvenning av fôret?

- Ja
- Nei

Plass for kommentarer:
Tar du vanligvis bort gammelt fôr før du fôrer med nytt?

- Ja
- Nei

Plass for kommentarer:
Hvor tømmer du vanligvis gammelt fôr?

- I innhegningen
- Utenfor innhegningen
- Annet, oppgi i kommentarfeltet under

Plass for kommentarer:

Her er de siste spørsmålene relatert til fôring:
Påvirker tilgangen av ulike fôrmidler (silofôr/surfôr /pellets/lav) ditt valg av fôr? Forklar gjerne i kommentarfeltet under.

- Ja, oppgi hvordan i kommentarfeltet under
- Nei

Etterspør du analyse av grovfôret med hensyn til næringsinnhold og/eller hygiene?

- Ja, næringsinnhold
- Ja, hygiene
- Ja, både næringsinnhold og hygiene
- Nei

Plass for kommentarer:
Legg gjerne igjen andre kommentarer relatert til fôring og / eller andre refleksjoner på undersøkelsen her:

Bli med og bidra til mer kunnskap om reinens helse, fôring og ta del i det siste innen forskning på reinsdyr! Vi søker deltakere som ønsker å delta i et planlagt dybdeintervju angående reinens helse og effekter av fôring. Intervjuet vil i hovedsak bli gjennomført av Karin Wallin Philippot i Sverige og av Alfa Josteinsdottir i Norge, der vi sammen blir enige om en tid og sted for gjennomføringen.
Vil du være med og bidra til mer kunnskap og ta del i det siste innen forskning om smittsomme sykdommer hos reinsdyr?

- Nei takk
- Ja, jeg vil vite mer

Information letter to the questionnaire

The Swedish letter accompanying the survey about the purpose of the survey and handling of personal data.

INFORMATION OM HUR MINA PERSONUPPGIFTER HANTERAS I ENKÄTEN OM RENHÄLSA OCH UTFODRING
Personuppgiftsansvarig
Sveriges lantbruksuniversitet (SLU), Statens veterinärmedicinska anstalt (SVA) och Universitetet i Tromsø - Norges arktiska universitet (UiT) är gemensamt personuppgiftsansvariga för behandlingen av dina personuppgifter och kommer att behandla dina personuppgifter för att följa reglerna kring allmänna handlingar och myndigheters arkiv. Dataskyddsombud vid SLU nås via dataskydd@slu.se eller 018-67 20 90, UiT Norges arktiske universitet nås personvernombud via personvernombud@uit.no, telefon: +47 77 64 63 22 og + 47 97 69 15 78. Dataskyddsombud vid SVA kontaktas genom att skriva till Statens veterinärmedicinska anstalt, SVA 751 89 Uppsala.
Informationen från enkätsvaren kommer de i inbjudan nämnda kontaktpersonerna i från Norge och Sverige att arbeta med tillsammans (såsom att analysera enkätsvaren och publicera resultaten) och kommer vara en del av tre forskningsprojekt, se nedan.
Ändamål
Renskötare i både Norge och Sverige tvingas på grund av förändrat klimat, extrema väderförhållanden eller brist på tillgång av betesmarker allt oftare att nöd- eller stödutfodra sina renar under vinter- och vårsäsongen. I dagsläget vet vi mycket lite om hur utfodring påverkar renens hälsa och beteende, men vi vet sedan tidigare att ökad djurtäthet och stress hos renarna kan leda till ökad förekomst av infektionssjukdomar.
Genom att besvara den här enkäten bidrar du till ökad kunskap om hur dessa förändrade förhållanden påverkar renskötseln. Detta leder till att vi tillsammans kan hitta lösningar och strategier för att möta framtida utmaningar inom renskötseln.
Ändamålet med personuppgiftsbehandlingen är att genomföra en enkätundersökning där informationen kommer att användas som underlag i en del av två forskningsprojekt i Sverige, ett som berör infektionssjukdomar i ögon och mun hos ren (Karin, SVA) och ett som undersöker för effekter

av utfodring av ren (Heidi, SLU) samt för norsk del som underlag för ett examensarbete i Norge. Genom att lämna ditt samtycke godkänner du att SLU, SVA och UiT behandlar dina personuppgifter. Dina personuppgifter kommer att behandlas för att kunna skicka ut enkäten och för att kunna behandla och kategorisera dina svar. Resultaten kommer att presenteras på sådant sätt att svar inte kan härledas till enskilda renskötare. Uppgifterna kommer endast att behandlas för att kunna genomföra enkäten.

Läs mer om de svenska forskningsprojekten här:

Infektionssjukdom i ögon och mun hos ren

Effekter av utfodring

Rättslig grund

Enligt förordningen om SLU, 1a§, ska SLU bedriva forskning. Vår behandling av dina personuppgifter är nödvändig för att kunna bedriva forskningen, vilket gör att den rättsliga grunden för att vi behandlar dina personuppgifter är att SLU ska utföra en uppgift av allmänt intresse. För utskick av enkät och hantering av enkätsvaren är den registrerade lämnat sitt samtycke för behandling av personuppgifter för det ändamålet.

SLU och SVA är statliga myndigheter och har en skyldighet att följa reglerna för allmänna handlingar, myndigheters arkiv och offentlig statistik. Universitetet kommer därför även att behandla personuppgifterna på de sätt som krävs för att kunna följa gällande lagstiftning.

Offentlighetsprincipen

Som svenska statliga myndigheter omfattas SLU och SVA av offentlighetsprincipen. Det innebär att alla handlingar, inklusive personuppgifter, som inte är arbetsmaterial är allmänna handlingar och kan komma att lämnas ut till den som begär det. I vissa fall omfattas dock uppgifter av sekretess och lämnas därför inte ut.

Användning av personuppgifter

Endast uppgivna kontaktpersoner, som är Morten Tryland (Norge), Karin Wallin Philippot och Heidi Rautiainen (Sverige), kommer att ha åtkomst till frivilligt angivna personuppgifter.

Lagring

Dina personuppgifter och svar lagras också så länge det krävs enligt lagstiftningen om allmänna handlingar och myndigheters arkiv. I det här fallet innebär det att dina uppgifter kommer att sparas i minst 10 år. Om informationen är viktig för framtida forskning kan den behållas längre än så.

Dina rättigheter

Du har enligt lag rätt att under vissa omständigheter få dina uppgifter raderade, rättade, begränsade och att få tillgång till de personuppgifter som behandlas, samt rätten att invända mot behandlingen. För att använda dig av dina rättigheter, kontakta integritets- och dataskyddsfunktionen med kontaktuppgifterna nedan.

SYNPUNKTER

Om du har synpunkter på SLU:s personuppgiftsbehandling kan du vända dig till integritets- och dataskyddsfunktionen på dataskydd@slu.se eller 018-67 20 90.

Du kan också vända dig till dataskyddsombudet hos SVA genom att kontakta Statens veterinärmedicinska anstalt, SVA 751 89 Uppsala

Om du inte är nöjd med SLU:s eller SVA svar, kan du vända dig med klagomål på behandlingen av dina personuppgifter till Integritetsskyddsmyndigheten, E-post: imy@imy.se, eller 08-657 61 00. Du kan läsa mer om Integritetsskyddsmyndigheten (IMY) på www.imy.se.