FACTSHEET

Effects of climate change on reindeer

Background

Reindeer (*Rangifer tarandus*) are indigenous to the arctic and alpine areas of Northern Europe, North America, Greenland and Asia. On a global basis there are around five million reindeer. Historically reindeer constituted part of the megafauna that existed during the Pleistocene (an epoch that lasted from around 1.8 million years ago until 11,500 B.C. and during which several ice ages occurred). Many of the animals that lived during this period became extinct, but reindeer were one of the species that survived. Detailed evidence exists to suggest that arctic herbivores and the plants that sustain them have displayed considerable flexibility in relation to climatic and other changes since the last ice age. How this indigenous arctic animal will cope in response to current climatic changes (happening much faster than previously) is a highly complex issue.

Wide distribution

Reindeer have a circumpolar distribution and live in several different types of habitat (forests, mountains, tundra). This means that it is difficult to generalise about how current climatic changes will affect reindeer and their survival. There will be large variations in how climate change will affect the various reindeer populations from area to area.

In mainland Norway, wild reindeer live only in southern Norway. They almost became extinct due to hunting and the introduction of tame reindeer, but small residual herds have survived. Due to extensive infrastructure and the introduction of reindeer husbandry, the wild reindeer in Norway have not recovered to their former distribution numbers. The three original, main areas of distribution for wild reindeer are today fragmented into 23 smaller areas (Fig. 1). In northern Norway, wild reindeer became extinct during the middle of the 19th century. Today there are only tame reindeer in the northernmost part of Norway. Tame reindeer herding is an important source of income for the population in the north and it could suffer as a result of any negative effects of a warmer climate on reindeer survival.

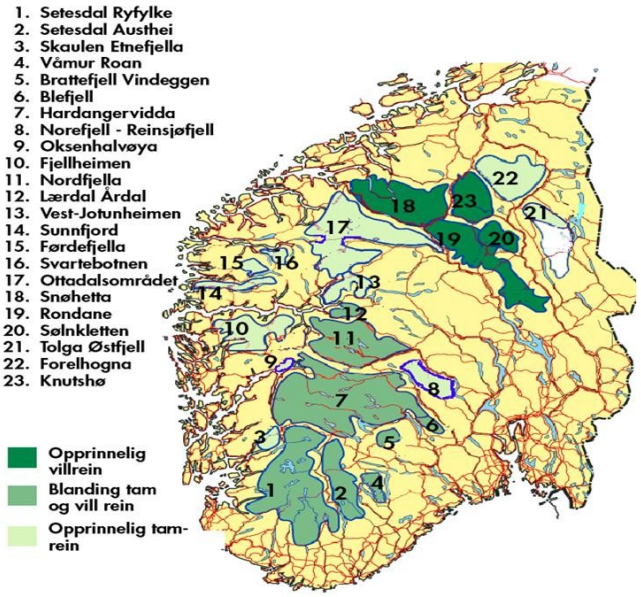

Figure 1: Current wild reindeer areas in Norway and genetic background of the population (Source: Norwegian Directorate for Nature Management, 2002).

The only area in the Arctic with Norwegian wild reindeer is Svalbard (Photo 1). It is not certain how climate change will affect that population, but since there are no reindeer predators on Svalbard, access to food and climatic conditions are the factors that have a limiting effect on the reindeer population. Access to food and climatic conditions are closely linked, so major changes in the climate would probably be significant. Even so, most wild

reindeer populations in the world would be subject to the same effects of climate change.

Photo 1: Reindeer stag, Svalbard, Norway.

Synchronised populations are a threat

It is natural for reindeer populations to vary in size over time. Such fluctuations are often controlled by climatic conditions, which in turn affect access to food. Predators also have an impact, but climatic conditions have been shown to affect reindeer populations regardless of whether or not predators are present. When a herd is small, there is an increased likelihood that it will die out. This is the critical phase of a herd's development. Climate change could increase natural population fluctuations.

Studies on the impact of major climate systems such as the NAO (North Atlantic Oscillation) study on reindeer populations in Greenland reveal that the climate can synchronise population fluctuations. This has also been shown to apply to the effects of AO (Arctic Oscillation) on Svalbard reindeer. Each population would reach the lowest point on the population curve at the same time. One dramatic event could wipe out several populations at the same time and this would prevent re-establishment, with populations dying out. In areas inhabited by reindeer this would have dramatic consequences for the survival of these herbivores and could have a major impact on arctic ecosystems.

What changes are anticipated for reindeer populations?

Access to food

The climate is very important for reindeer access to food. Calving occurs during those periods when the plants that they eat are most nutritious, i.e. just before flowering. The reason for this adaptation is the tremendous requirement that the does have for producing milk for their calves. If spring comes earlier and plants start to grow and flower earlier, the calves could be born after the plants have passed their most nutritious phase. This could reduce their condition, survival rate and the growth of the herd. If the snow melts earlier and autumn comes later, the growth season will be extended. At the same time, permafrost melting will release nutrients through the decomposition of previously frozen organic materials - something that would be beneficial for plant growth. Such an extension of the growing season, along with the release of nutrients, could serve to increase plant production and result in an increase in the amount of plant materials available to reindeer during the summer season. Consequently, reindeer populations would increase.

However, having better access to food during summer is not an advantage if there is a corresponding or greater decrease in access during the winter. During the winter, reindeer dig their way through the snow in order to reach their food which usually consists of lichen or evergreen plants. Reindeer expend 30% more energy on digging for food than they do on normal walking. A warmer climate would result in an increased likelihood of freeze-thaw periods with ice-crusts being formed on the snow. This would make it harder for the animals to reach the food beneath the snow and increase the amount of energy used by the animals to break through the ice-crust. Such a loss in energy would have a highly negative impact on the condition of the does and calves and could thus contribute towards reducing survival rates during the cold season (Photo 2).

Climate change could increase natural population fluctuations.

Photo 2: A reindeer calf that has died from starvation due to ice-crust formation on its grazing grounds.

As herbivores, reindeer are dependent on access to nutritious plants that they can digest. Climate change would result in changes in the composition of plant communities. There are already clear signs that willow and dwarf birch are becoming more dominant as the climate becomes warmer. This has a detrimental impact on the diversity of grasses and herbs, which are important plant groups for reindeer. Since reindeer are relatively flexible about their choice of food, it is too early to say anything definite about the consequences of this spread and the population dynamics of reindeer.

Insect problems

Mosquitoes, warble fly and nose bot fly can be extremely troublesome for reindeer. Warm summers and annoying insects often cause major problems that are detrimental to reindeer. These insects cause reindeer to eat less because they spend considerable time and energy on running to evade these parasites. They spend a lot of time in snowfields where the insects are less bothersome than in the vegetation (Photo 3). The calves in particular suffer from insects; an increase in the number of mosquitoes and warble and bot flies can affect their condition and chances of surviving the winter. Warble and bot flies are not found on Svalbard, so these irritating insects are not currently a major problem there. However, it is not known if these insects will ever reach Svalbard at some stage. Warble and bot flies were previously introduced to Greenland with the import of reindeer from Norway.

Condition, fertility and survival

There are close links between the condition of the does, gestation and calf survival. The physical condition of the does is at its lowest ebb when they are calving. The summer season is therefore extremely important for ensuring that the does are able to replenish their bodily reserves in time for the rutting season during the autumn – and a long winter. For example, during the autumn Svalbard reindeer may put on as much as one-third of their total body weight. The intensity of insect problems can therefore be decisive for weight increases during the summer.

Photo 3: A herd of reindeer seeking shelter from troublesome insects in a snowfield.

Fertilisation in October is dependent on whether or not the condition of the does reaches a threshold that will enable them to nurture their calves during the winter. The condition of the does during the winter is decisive for the condition of the calves and their survival when they are born. Small calves have a lower survival rate and if they have limited access to food during the winter, calves that are born weak will be vulnerable. If the following summer is also bad, then the negative effects will accumulate and the long-term survival rate of the herd could be reduced.

Conclusion

It is fairly certain that climate warming will change reindeers' access to food, migration patterns and exacerbate the problems caused by insects. These changes will affect the condition, fertility and survival rates of reindeer. How this will scale up through population levels and reindeer ecosystems is less certain. Even if the amount of food available during the summer increases due to a warmer climate, access to the same food during the winter could be reduced due to more snow, increased snow density and ice-crusts. Reindeer change their grazing areas at regular intervals, depending on snow and grazing conditions. Such changes in their migration routes in Norway are limited due to the high degree of fragmentation of their grazing areas. Reindeer in Norway have extremely limited options for adapting to a rapidly changing climate. This could prove to be fatal for this indigenous animal.

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