

Manipulation of tourism traffic system in an important wild reindeer migration route in Norway

Oddgeir Andersen, Norwegian institute for nature research (NINA), oan@nina.no

Vegard Gundersen, Norwegian institute for nature research (NINA), Norway

Olav Strand, Norwegian institute for nature research (NINA), Norway

Line Camilla, Wold Norwegian institute for nature research (NINA), Norway

Odd Inge Vistad, Norwegian institute for nature research (NINA), Norway

Background

Wild mountain reindeer (*Rangifer tarandus tarandus*) (or caribou in North America) is the most widespread and abundant large herbivore in tundra ecosystems. Economically, culturally, and socially, the species has contributed through millennia to shaping rural mountain cultures and boreal regions. Contemporary developments in rural areas, and increasing pressure and piecemeal fragmentation of reindeer habitats, have led to international recognition of the species' vulnerability. Greater interest and awareness of the role of reindeer in arctic and alpine ecosystems, combined with rural communities' needs for economic development, have led to calls for a change in the existing management system with greater involvement of stakeholders (Kaltenborn et al., 2014). The daily management of the wild reindeer areas is carried out in cooperation between the private and public sectors. The main responsibility for day-to-day operation is attended to by a landowners' body, usually called the wild reindeer committee, while the state-run wild reindeer board exercises public authority. When a gravel road used in a former military shooting range at the Dovrefjell mountain plateau in Norway where decided to be removed and restored back to nature, the local stakeholder advocates to keep the road for local development and tourism. The source of conflict is a tourist cabin (Snøheim) situated in the end of the 13-kilometre road, located in the Dovrefjell-Sunndalsfjella national park (Figure 1). In all, 5800 tourists overstay in the 2013 summer season, and most of the tourist walked to the top of the mountain Snøhetta (2287 m.a.s.l). The main challenge to keep this road is that the wild reindeer herd in the area had to cross over the road as a part of their seasonal migration in the period of August to October, which coincide with the last part of the high season for tourism in this area and the start of the hunting season (starts August 20th) for wild reindeer. A central question was how to combine the use of the road with the migration route of wild reindeer?

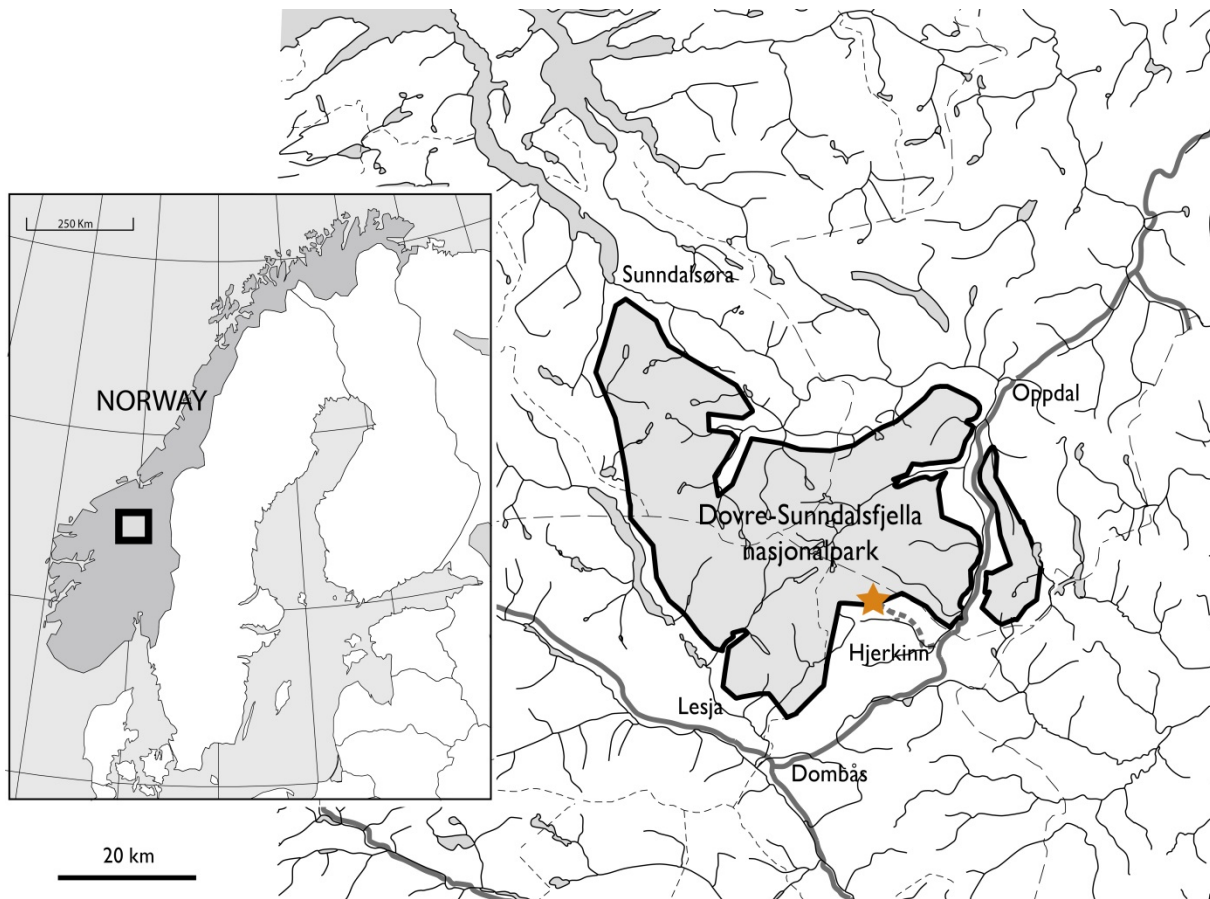


Figure 1. The study area. The boarder of Dovre-Sunndalsfjella national park is shown as black solid line, and the gravel road from Hjerking (shown as grey dots) to the tourist cabin Snøheim (marked with orange star).

The experiment

In cooperation with the local authorities and the wild reindeer management board for Snøhetta management area, we carried out a four-years experiment, including two different regimes of the use of the road: In 2010 and 2011 there was access for all to drive along the road with private cars and in 2012 and 2013 we closed the access for private cars to the road, and introduced a shuttle bus with five departures daily. Our aim with the experiment was to monitor the changes in the use of the area, from a private car regime to a shuttle bus regime. We used different methods to monitor changes; Automatic counters with pyroelectric sensors that detect the heat radiation emitted by human bodies were placed out at all marked paths in the area ($n=14$). For details and concerns about this method, see Andersen et al. (2014). A trail use index (TUI) for each counter location was calculated as the average number of registrations per hour ($\frac{\sum \text{counter recordings per day}}{12 \text{ hours}}$) between June 15th to October 1st. A low season was defined from June 15th –July 7th, a high season from July 8th - August 7th, a hunting season from Aug 20th - Sept 20th. Based on the time-distribution of the recordings, we used 12 hours (08:00 am – 08:00 pm) as the daily activity timespan and categorized the trail use by the intensity of use (Range: <1 to > 30 persons per hour) and season. We also used GPS tracking of people by handing out GPS loggers (model: Trackstick, logging a GPS location every 5 sec.) to visitors entering the area at the starting point of the road to Snøheim ($n=976$ trips). Data from the GPS loggers was collected in a national database (www.dyreposisjoner.no) to secure them for public access in the future (Gundersen et al., 2013b) and to easy relate these data to an on-going study of wild reindeer movements and response to human activity. Reindeer locations (and also human activity, measured by GPS loggers) were analysed by using kernel density estimates to

identify areas conflicting between wild reindeer and recreational use. In addition, we used statistics from different sources describing activity including tickets, fees, and overnight stay at cabins on the area (Gundersen et al., 2013a). In this part of Snøhetta, 17 wild reindeer were GPS tracked during 2009-2011, and 6 in 2012. Altogether 14 GPS collared wild reindeer crossing over the road 223 times during the four-year period. The results show that both the spatial pattern of recreational use and the intensity of use changed substantially during the experiment, from being scattered and intensively conflicting the migration route, to be displaced to the end of the road and not conflicting the migration route. The data from GPS collared wild reindeer herds show that the migration route has been functional the whole period, but TUI levels of more than 20 persons per hour act like a human barrier in the landscape to wild reindeer. Ecologically, it is far too early to conclude how these changes will affect the wild reindeer migration in the long term. The project will continue to monitor the human use of the migration route.

References

- Andersen, O., Gundersen, V., Wold, L. C. & Stange, E. 2014. Monitoring visitors to natural areas in wintertime: issues in counter accuracy. *Journal of sustainable tourism*, 22, 550-560.
- Gundersen, V., Nerhoel, I., Strand, O. & Panzacchi., M. 2013a. Ferdsel i Snøhettaområdet - Sluttrapport. NINA Rapport 932.
- Gundersen, V., Nerhoel, I., Wold, L. C. & Mortensen., A. J. 2013b. Ferdsel i Snøhettaområdet - Del 2. Fokusområder og lokaliteter. NINA Rapport 934.
- Kaltenborn, B. P., Andersen, O. & Gundersen, V. 2014. The role of wild reindeer as a flagship species in new management models in Norway. *Norwegian journal of geography*, 68, 168-177.