



Hardangervidda National Park (HNP), Norway



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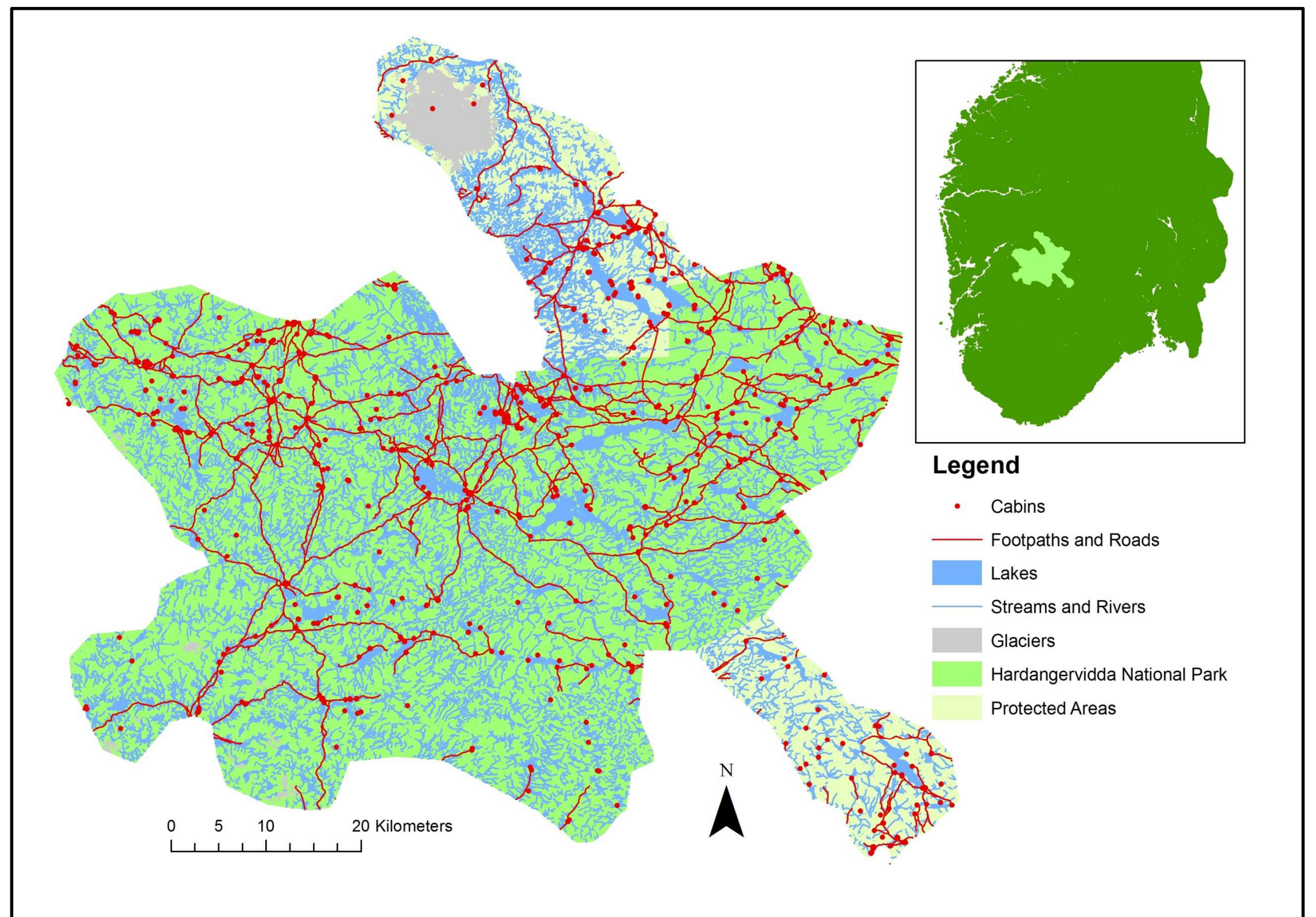


Background: Hardangervidda is the largest mountain plateau in Europe. The National park, which was established in 1981, covers 3422 km² and spans eight municipalities in three counties. Land is split approximately equally between state and private ownership. The protection regime falls under IUCN Category II (National Park), but the area also includes two Landscape Protected Areas (IUCN Category V).

Main purposes of establishing HNP

- (i) Protect a section of a very valuable high mountain plateau where the natural landscape is home to unique arctic flora and fauna.
- (ii) Protect the cultural heritage and the cultural environment, and allow for sustainable land use such as farming, grazing by livestock, and fishing.
- (iii) Protect and provide an environment for sustainable outdoor life and natural experiences, such as fishing, hunting, education and environmental research.

One of the primary reasons for establishing HNP was to secure living areas for the largest European wild reindeer population.



Many factors influence the wild reindeer population in HNP (**Table 1**). High population growth rates have been linked to low snow-cover, and high suitability and accessibility of **winter and summer pastures**. Accessibility of summer pastures is constrained by **tourism**, whereas winter fodder is controlled by snow and ice conditions.

Reindeer depend greatly on **lichens** as a food source in the winter, and estimation of lichen biomass by earth observation is therefore a key factor for the future management of reindeer populations. Reduced lichen cover may be caused by overgrazing, but a preliminary analysis of lichen biomass from Landsat imagery did not indicate a significant response to peak reindeer densities in 1983 and 1997.

Body weight is gained in the summer, but while the best summer pastures are located in the north of HNP, reindeer consistently use the same pastures in the south (**Figure 2B**). This is probably caused by **increased tourist activity** in the north.

The wild reindeer population on the Hardangervidda plateau is important for its **ecological value**, but also for its **economical and recreational value** for hunters and landowners. The population has experienced frequent fluctuations in harvest numbers over the last six decades because data on herd size is uncertain, there is a lack of data on recruitment and other life stage characteristics, and because there is a high variation in hunting success (**Figure 1**).

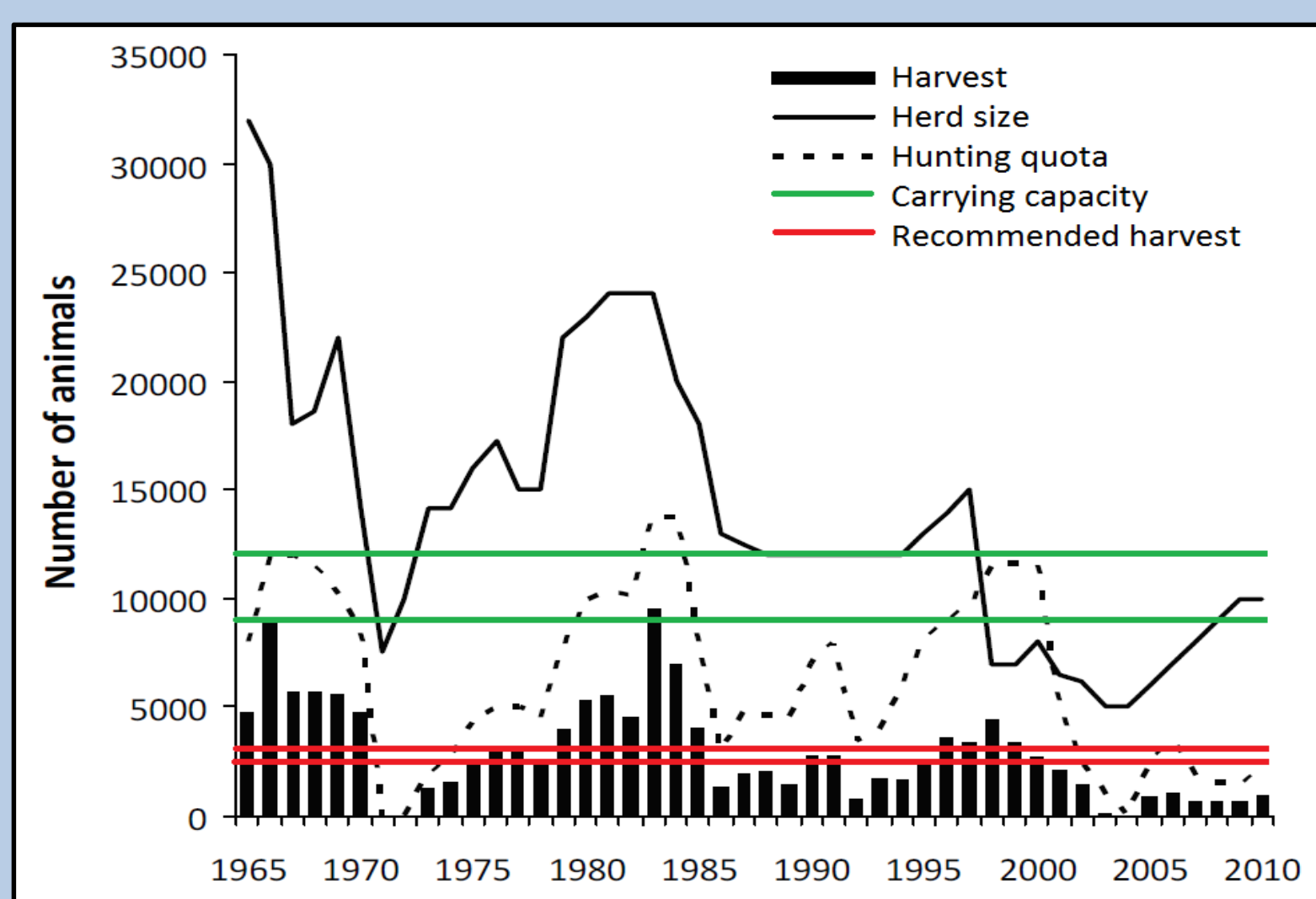


Figure 1: Number of reindeer (herd size, harvest and harvest quota) between 1965 and 2010. Figure modified from Figure 2 in Bjerketvedt et al (2014)².

Table 1: Factors influencing migration, survival and recruitment of the wild reindeer population in HNP, along with data that can be used to quantify these factors.

Human infrastructure & activity	Point data and in-situ data
Climate	Snow cover, wind, precipitation, temperature
Suitability of summer pastures	NDVI, in-situ data
Suitability of winter pastures	NDMI/NDLI for lichen biomass calculation, snow cover
Hunting	Population data and quotas

Main Research Questions

- (i) What are the temporal changes in vegetation and snow cover, and what are the subsequent effects on ecosystem function and services?
- (ii) What causes the Reindeer population to fluctuate through time?

HNP Management: To inform the management of the reindeer population, more reliable information must be gathered on the distribution of **lichen biomass** in the winter grazing areas, and other **vegetation biomass** in the summer grazing areas. More effort must also be put in to gathering data on the effects of **human infrastructure and activity** on wild reindeer migration. **Remote sensing imagery** and **GPS tracking** of wild reindeer are great assets to these efforts.

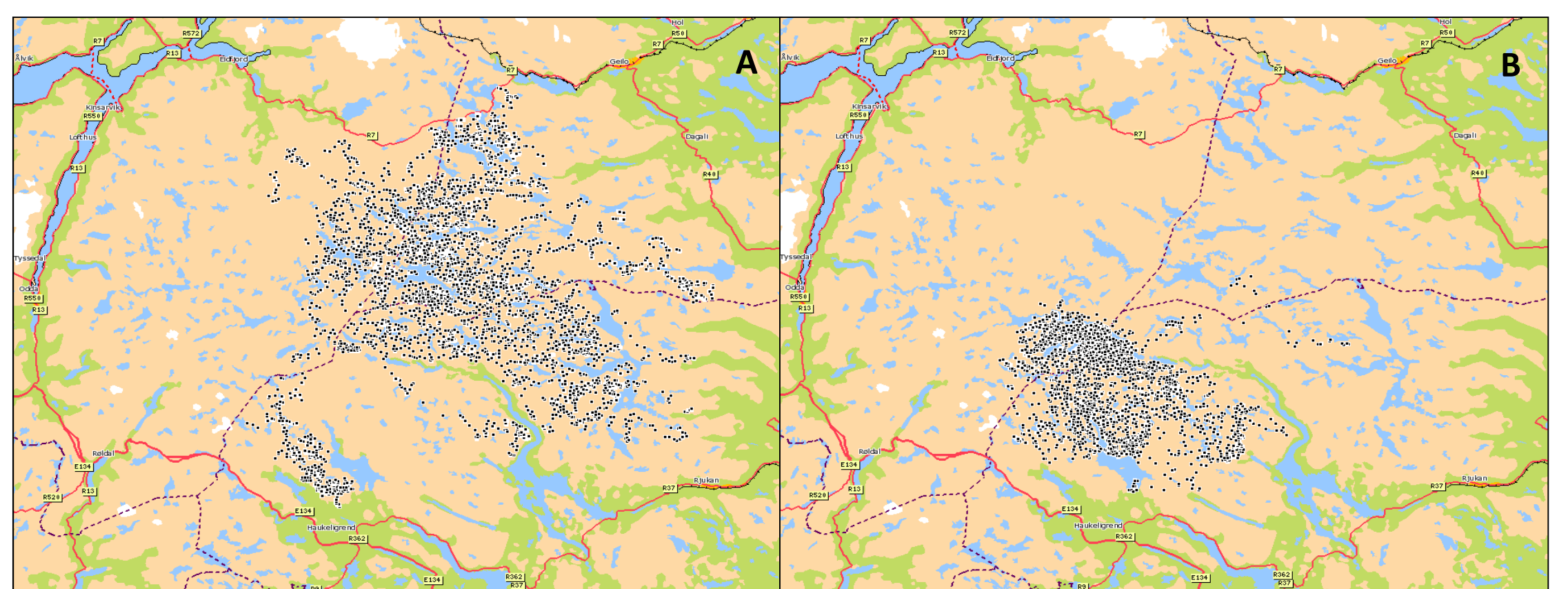


Figure 2: GPS positions of reindeer in HNP **A:** January-March 2015 and **B:** May-July 2015. Site fidelity is very high in the summer months, whereas winter locations appear to be dependent on snow cover. ©NINA/ Norge Digitalt

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²Bjerketvedt, D. K., Reimers, E., Parker, H., & Borgstrøm, R. (2014) Rangifer, 34(1), 57-72.

Map data from Geonorge/ Kartverket/ Norge digitalt



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