

# Snow, Shotguns and Survival:


## How Snow Depth and Hunting Shape Willow Ptarmigan (*L. lagopus*) Populations in Trøndelag


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### Background

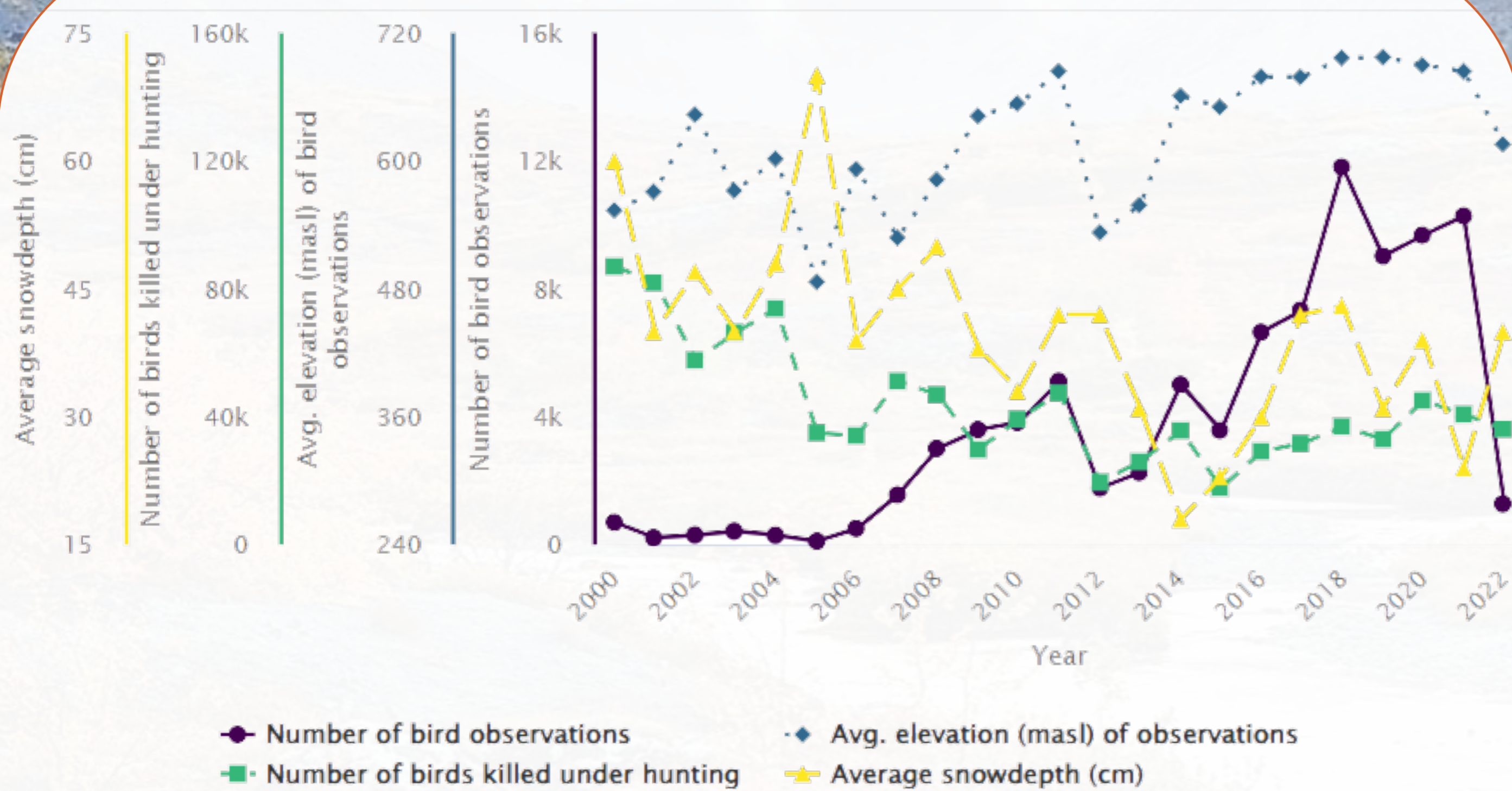
The population of Norwegian willow ptarmigan (*Lagopus lagopus*) has been fluctuating over time. The bird, which is typically found in or around montane birch forest, is a popular target for recreational hunting from September onwards. It being a resident bird, means that it stays in this habitat year-around. Winters here are typically associated with freezing temperatures, darkness, and snow. We sought to find out if and how these factors could help explain fluctuations in population size.

### Predictions

 **Snow depth:** We expect a decrease in snow cover would negatively affect ptarmigan population size by reducing their protection from predators and exposing them to harsher winter conditions.

 **Hunting:** We expected hunting to have a negative effect through both direct (population reduction) and indirect (behavioural stress) impacts on survival and behaviour.

 **Elevation:** We expected willow ptarmigan to seek higher altitudes in years with less snow.



**Figure 1:** Annual number of willow ptarmigan observed, average elevation of observed birds, number of birds harvested in hunting, and snow depth change from 2000 to 2022 in Trøndelag, Norway.

### Methods

Observational data was used as an approximation of population size. To stastically analyze the data, we included the three variables snow depth (cm), number of birds harvested by hunting and elevation (masl). Pearson correlation was utilized to construct a model showing the variable relations at all junctures, while we utilized the 'Highcharter' package in R to visualize the model.

### Results

Between 2000 and 2022, there was a decrease in snow depth and the number of birds killed by hunting, while there was an increase in the number of observed birds and the elevation where the birds were observed.

All of the hypothesized relationships were significant:

- Average snowdepth (cm) and number of observations: (R = -0.44, p < 0.05): **Opposite of prediction**
- Average snowdepth (cm) and average elevation (masl) of bird observations: (R = -0.59, p < 0.01): **As predicted**
- Number of birds killed under hunting and number of observations in year+1: (R = -0.51, p < 0.05): **As predicted**

